

NO 61.



RIO DE LA PLATA



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U. S. HYDROGRAPHIC OFFICE,

No. 61.

THE

RIO DE LA PLATA.

COMPILED BY

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UNITED STATES NAVY.



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ADVERTISEMENT.

The principal authorities consulted in the compilation of this work are : Nouveau Manuel de la Navigation dans le Rio de la Plata, by Ernest Mouchez, Capitaine de Frégate, French navy ; Manuel de la Navigacion del Rio de la Plata, by Señores Lobo and Riudavets, Spanish navy ; South American Pilot, Part 1, 1874, by Staff Commander James Penn, English navy ; La Plata, the Argentine Confederation, and Paraguay, by Thomas J. Page, United States Navy ; Appleton's American Cyclopedia ; Imperial Gazetteer ; Report of Mr. Thomas B. Wood, consul of the United States at Rosario, dated September 30, 1873 ; Reports of Mr. Joel, British consul at Rosario, dated August 31, 1871, and November 19, 1872 ; Notions on the Chorography of Brazil, by Joaquin Manoel de Macedo, translated by H. Le Sage ; remark books of United States vessels on the South Atlantic station, Notices to Mariners, Hydrographic Notices, Geographical Magazine, &c., &c., &c.

R. H. W.

U. S. HYDROGRAPHIC OFFICE,

Washington, D. C., November 18. 1874.

NOTICE.

All bearings and courses are *true*, except where otherwise stated.

The direction of the wind is the point from which it blows; that of the current, the point to which it sets.

The distances are expressed in nautical miles; the cable's length assumed to be equal to 100 fathoms.

The longitudes are reduced to the meridian of Greenwich.

LIST OF PLATES.

	Page.
View of the land northward of Castillo cape. }	
View of the land northward of Santa Maria cape. }	10
View of the land southward of Santa Maria cape. }	
View of Lobos island. }	
View of Negra point. }	14
View of Flores island. }	
View of Montevideo cerro. }	
Indio light-vessel. }	
Chico light-vessel. }	62
Indio point. }	
Magdalena church. }	
Leading marks for Catalina channel.....	70
Chart of the Rio de la Plata follows page.....	161



TABLE OF CONTENTS.

	Page.
ADVERTISEMENT	III
NOTICE	IV
LIST OF PLATES.....	V
GENERAL REMARKS: discovery; limits; affluents; bed of the estuary; pilots; coast of the estuary; anchorages; climate.....	1-5
NORTH COAST OF THE ESTUARY: Cape Castillo and Coronillo point; island; anchorage; cape Polonio; anchorage; Torres island; Bisson reef; anchor- age; remarks; Polonio reef; tides and variation; Punta Rubia; cape Santa Maria; islets; dangers; light-house; Arrecife anchorage; Paloma harbor; tides; soundings; remarks; point Piedras; reef; San José Igna- cio lagoon; Maldonado point; East point; light-house; Lobos island; channel between Lobos and the main land; mountains; soundings; mountains; Pan Azucar; Sierra de las Animas; Maldonado bay; Gorriti island; East bank; New Rock; Monarch rock; leading marks; anchor- ages; Maldonado town; supplies; pilots; Ballena point; tides and cur- rents; Potrero bay; Negra point; English port; Afilar point; Solis reef; Afilar reef; Piedras Negras point; Santa Rosa beach; Pando river; Car- retas point; Brava point; Basuras bay; Flores island; light-house; vari- ation; dangers; Sara bank; Bump shoal; Carretas reef; Forest King reef; Luz islet; remarks; Buen Viaje shoal; Caleta point; soundings..	5-29
MONTEVIDEO BAY AND CITY, REPUBLIC OF URUGUAY: San José point; break- water; lights; variation; Lobos point; Cerro light-house; Montevideo bay; Ratones island; rocks; Sarina reef; Triton bank; Familia rocks; anchorages; landing place; lighters; tugs; tides and currents; sup- plies; dry-dock; defenses; army; navy	29-36
URUGUAY: area; population; immigration; mortality; government; depart- ments; towns; rivers; lakes; surface; natural productions; climate; agriculture; stock; animals; birds; commerce: exports; imports; rail- ways; telegraphs; artificial harbors; public debt; history; Montevideo city; shipping; steamers; duties on imports; duties on exports; port charges; hospital dues; pilotage; moneys; weights and measures; tele- graphs	36-45
NORTH COAST, (Continued:) Espinillo point; shoal; Panela rock; light-ship; directions; shoals; Santa Lucia river; channels; cliffs; San Gregorio point; banks; Jesus Maria, or Sandy point; bank; Pavon point; San Mi- guel river; Ensenada de Pavon; Rosario point; Pavon and Pereyra riv- ers: Cufre river; Rineon del Cufre; Rosario river; Sauce point; Artil- leria point; Pipas rocks; Angostura point; Colonia del Sacramento; marine railway; wharf; supplies; light-house; Colonia roads; islands and reefs: Fishers' bank; Farallon islet and reef; Beaumanoir rock; San Gabriel island; Laja bank; Lopez islets; Lopez road; Relampego rock; Hornos islands; Etna rock; directions; coast; landmarks; San Juan river; Cerros San Juan; Martin Garcia island: beacons and light; Mar- tin Garcia channel: buoys and beacons: canal Infierno.....	45-58

	Page.
SOUTHERN COAST OF THE ESTUARY: Cape San Antonio; Rasa point; Tuyu bank; soundings; tides and currents; San Borombon; landmarks; Juncal; Rodeo; Mount Rosas; Salado river; tides; San Borombon river; mount Juan Jeronimó; Piedras point; Piedras bank; Cerro San Salvador Grandé; Indio point; remarks; tides; light-ship; Magdalena; Embudo point; soundings; Atalaya point; Atalaya river and bank; Chico light-ship; remarks; Barragan bay; Santiago point; Lara point; wreck; Santiago bank; landmarks; directions; tides; variation; village; Quilmes and Colare points; Lara bank; light-ship; light-house	56-68
BUENOS AYRES: anchorages; Outer road; bar; Inner road; the Pozos; directions; character of the bottom; Boca bank; Riachuelo river; landing-place; communication; piers; winds; tides.....	68-72
ARGENTINE REPUBLIC: boundary; area; divisions and population; immigration; description; climate; natural productions; products; exports; wool and sheep; hides and cattle; distribution; imports; increase of imports; trade; revenue; expenditure; customs tariff; importation; exportation; agriculture; education; army and navy; telegraphs; shipping; steamers; railways; projected railways; public debt; moneys; weights and measures; treaty.....	72-79
HISTORICAL SKETCH: discovery; settlement; war for independence; formation of the government; war with Brazil; Rosas; peace with Brazil; confederation of the provinces; insurrection; Rosas dictator; war with Uruguay, Paraguay, and Brazil; intervention of the French; peace with France and Uruguay; blockade of Buenos Ayres; Rosas overthrown; Urquiza dictator; Buenos Ayres secedes; new constitution; civil dissension; Paraguayan war; civil wars; plague; controversy with Brazil; revolution	79-88
CITY OF BUENOS AYRES: dimensions; description; sanitary defects; squares, buildings, &c.; places of worship, &c.; police; municipal government; communication; need of facilities for landing cargoes; shipping; remarks; lines of steamers; remarks; freights; supplies; American houses	88-92
COAST NORTHWARD OF BUENOS AYRES: Olivos bay; Las Conchas river; delta of the Parana	92-93
PORT AND CITY OF ROSARIO: remarks; Rosario; growth; report of Consul Wood; river navigation; railway system; telegraphs; trade, (foreign;) home trade; United States flag; remarks; supplies.....	93-97
BANKS AND SOUNDINGS: caution; bed of the estuary; channels; soundings; parallel of 34° S.; parallel of 34° 25' S.; parallel of 34° 40' S.; parallel of 35° S.; parallel of 35° 11' S.; parallel of 35° 20' S.; La Plata bank; English bank; light-ship; bell-buoy; wrecks; Archimedes bank; Meduse bank; Narcisse bank; Astrolabe bank; French bank; shoal; Ortiz bank; Cuirassier bank; Chico banks; tides; Coast bank; danger.....	98-107
TIDES AND CURRENTS: causes; rate; ground-log; currents caused by winds; remarks; tides at Buenos Ayres; tides in San Borombon bay; tides of the north coast; current from the rivers	107-111
WINDS AND CLIMATE: winds; summer; Virazon; winter; pamperos; indications; SE. gales; barometer; thermometer; fog and haze; rain; dews; thunder and lightning; mirage	111-118

TABLE OF CONTENTS.

ix

	Page.
NAVIGATION OF THE ESTUARY: landfall; from Lobos to Flores; from Montevideo to Buenos Ayres; North channel; beating; Middle channel; South channel; beating through the South channel; to Colonia; to the rivers; pilots; landmarks; Martin Garcia channel; Infierno channel; Carretas rocks; tides; mouths of the Uruguay and Parana.....	118-130
AFFLUENTS OF THE PLATA: remarks; anchoring; grounding; fuel and supplies	130-133
PARANA RIVER: Rio Paranahyba; Rio Grande; Parana river; Sete Quedas; length; volume; head of navigation; below the Paraguay; affluents; Salado river; Tercero river; Gauaguay river; delta of the Parana; annual rise; depth of river; bars; current; towns on the river banks; remarks	134-140
PARAGUAY RIVER: source; headwaters of the Paraguay and Amazon; tributaries; head of navigation; Sipotnba river; lakes Obiraba and Gahiba; Cuyaba river; Cuyaba town; San Lourenço; Dourados; Dourados to Corumba; Lake Mandioré; remarks; Corumba; remarks; Tacoary river; Otuquis river; fish and game; Latiriquiqui river; Blanco and Apa rivers; Jejui river; Confuso river; Pilcomaio river; Vermejo river; remarks; navigation of the river; Asuncion; annnal rise.....	140-150
URUGUAY RIVER: source; Salto; tributaries; navigation; entrance; aspect; banks; Fray Bentos; conception; remarks; rise of the river; caution..	150-152
RIVER DISTANCES	152
TABLE OF POSITIONS	154
INDEX	155
LIST OF LIGHTS	161

THE RIO DE LA PLATA.

GENERAL REMARKS.

The Rio de la Plata was discovered October 8, 1508, by the Spanish navigators Juan Diaz de Solis and Vincente Yanes Pinçon, while seeking for a passage to the Pacific Ocean. The Indians whom they encountered called the river Paraná Guazú. After a short stay, their vessels were driven to sea by a gale, and they returned to Spain to report the discovery. In 1515, Solis revisited the estuary and anchored off the Sierra de las Animas, near to a small river which now bears his name. On landing, he, together with six of the crew of the vessel, were murdered by the Indians. Solis named the estuary Mar Dulce; after his death it was called the Rio de Solis until the exploration of Sebastian Cabot, in 1527, when it received the name Rio de la Plata, from the great number of silver ornaments worn by the natives of the adjacent country.

Discovery.

The Rio de la Plata is an estuary formed by the junction of the Parana and Uruguay rivers about 170 miles from the sea. The entrance is between Punta del Este, near Maldonado, and Punta Rasa, the north extremity of cape San Antonio; these two points are distant 120 miles, on a NE. $\frac{1}{4}$ E. and SW. $\frac{1}{4}$ W. bearing. The general direction of the estuary is to NW. by W.; the length is 150 miles from the line joining the points of entrance to the common mouth of the Parana and Uruguay. The width diminishes rapidly to 50 miles between points Piedras and Yeguas, 45 miles within, and to 21 miles between Colonia and Lara point. The head of the estuary is a semicircular space, about 18 miles in diameter, which is almost entirely occupied by an extensive sand-bank formed by the deposits of the rivers. This bank is subject to rapid and frequent changes, which are caused by the opposing wind and current.

Limits.

The limit of brackish water is nearly a direct line between point Piedras and the mouth of the San Lucia river; this

varies, however, with the prevailing wind and condition of the rivers.

Affluents.

The Parana and Uruguay receive in their course a great many important streams; those flowing into the former descend from the valleys of the Andes and cross the Chaco, an extensive, uninhabited, marshy plain; those flowing into the latter generally rise in the table-lands of Matto Grosso, within a short distance of the headwaters of some of the most important affluents of the Amazon. The Paraguay is the principal affluent of the Parana; it is navigable a distance of about 2,400 miles from the sea.

Bed of the estuary.

The bed of the estuary is strewn with extensive sand-banks and shoals, which contract the navigable space, especially between Montevideo and the head. The shoalest is the English bank; among the others the most important are the Ortiz, Archimedes, French, Meduse, Cuirassier, Chico, and Astrolabe.

The deposits brought down by the Parana and Uruguay, on arriving in the estuary, are subjected to the effects of violent currents and of the heavy sea produced by winds from the offing. Banks are thus formed, and the shape, depth, and dimensions of those already existing are materially changed. This, together with the fact of there having been no recent survey of the whole estuary, should put the mariner on his guard against a reckless reliance on the information contained in any printed instructions, or even the most recent charts.

The space southward of $35^{\circ} 30'$ S. is comparatively unknown, because of late years it has been very little frequented. Besides this, the sea, having a full sweep into this part of the estuary, produces rapid and frequent changes, which cannot be correctly delineated on a chart or described in sailing directions. A comparison of the old and recent charts is sufficient evidence of the extensive changes which are constantly occurring wherever the current runs strongest and the sea has a good sweep.

West of the meridian of Montevideo the bed of the river, between the banks, is of mud, sometimes hardened into clay; east of this meridian the bottom in the channels is also of mud, but there are exceptions to this rule. The banks are composed chiefly of sand; in some localities the bottom is rocky, in others the sand is mixed with gravel and shells,

and in the vicinity of point Piedras there is a bank composed chiefly of *tosca*, a species of rotten-stone. In thick weather or at night the pilots rely upon the character of the bottom more than the depth of water, for estimating the position. They assert that as long as the lead shows a bottom of pure mud, there is no danger, but as the mud becomes mixed with sand, it indicates an approach to dangerous depths, for the banks are composed chiefly of pure sand. The mud is not of the same nature everywhere; between Lobos and Montevideo, near the north coast, it is greasy or slippery, and has an entirely different appearance to that found near the south coast.

The south coast is fronted by a bank of loam, with occasional patches of *tosca* and of ooze, which extends out between 5 and 12 miles from the shore. The Cuirassier bank is chiefly composed of *tosca*; within a few years, the depth on this bank has increased from 13 to 16 feet. West of Montevideo, the depth of water in the channels is 4 to 6 feet more than that on the general surface of the banks; but there are several deep pools, of 5 to 7 fathoms depth, which are the result of strong eddies.

Bound to Maldonado, there is no sand-bank to be avoided; from thence to Montevideo the English bank is the chief danger. When bound to Buenos Ayres, all the important dangers must be guarded against, and it is advisable never to attempt the navigation of the estuary above Montevideo without a pilot. A notice was issued by the government of Uruguay, in 1870, earnestly advising all vessels to take pilots, on account of the numerous wrecks that occur between the entrance and Montevideo; these losses are due, almost entirely, to irregular currents, which the native pilots are more capable of estimating and guarding against than any stranger, however familiar with the navigation of the estuary he may deem himself to be. The pilot-boats are by law required to cruise between cape Castillo and Maldonado bay. Pilots.

The two coasts of the estuary are of an entirely different nature. The south coast is low and of uniform height; it is the termination of the *pampas*, which constitute the greater part of the Argentine Confederation; it is visible 7 to 8 miles, and at this distance nothing but the tops of the stunted trees are seen; these appear as if growing out of Coast of the estuary.

the water. There are no rocks or islands on this coast; the surface of the bottom fronting it is composed entirely of mud; this is sometimes very soft, but generally stiff, and occasionally as hard as stone; to this latter substance the name "*tosea*" has been given. The north coast is of medium elevation and undulating; spurs of hills branch out from the mountains of the interior, occasionally reaching down to the sea; and the mountains themselves are visible a considerable distance in the offing. The shore is fronted by rocky ledges, which occasionally rise to the surface, forming islets and islands, which are composed of granite and limestone. The early navigators never approached this coast, and it remained unknown until the commencement of the present century, when the English blockade, established south of English bank, compelled merchant-ships to seek another channel. Subsequently it was examined, and found to afford the best route for entering or leaving the river, and it is now almost exclusively used by all classes of vessels.

Anchorage.

Wherever the lead indicates a muddy bottom, there is good anchorage; if the wind is fresh, or a gale is approaching, care should be taken to avoid anchoring near the weather-side of a bank. From Lobos to Flores the mud is not deep, and below it there is a rocky or other hard substance, which sometimes causes the loss of anchors that have been down a long time. Outside of the estuary, vessels of any size may find good shelter, from southwesterly gales, behind capes Castillo and Santa Maria; but, since these anchorages are open from NE., round by E. to SW., vessels should not remain after the gale, from which they sought shelter, has abated.

Climate.

The climate of the Plata is considered the most agreeable and healthiest in South America. In the summer the thermometer rarely rises to 90° F., and in the winter it seldom falls to the freezing point. At Montevideo the range is still less, for, although the summer is a little warmer, the winter is never as cold as at Buenos Ayres.

The bad weather and violent winds experienced in the Plata have been much exaggerated; it is true that the changes of weather are frequent and rapid, but the force and duration of the gales are rarely equal to that of the gales experienced along our eastern coast during the cor-

responding seasons. The first gust of a pampero is often violent, but this is almost always of short duration. The natives of the country bordering the Plata assert that these gales are neither as strong nor as frequent as formerly. As there has been no change in the cause there can have been none in the effect. The belief is probably due to the improvements in ships and means of navigating the estuary, affording greater security to life, and enabling the mariner to battle more successfully against the elements.

NORTH COAST OF THE ESTUARY.

The coast of Brazil terminates in a long sand-beach backed with downs; at the end of this beach there is a rocky point which trends a few cables to the northward; this is cape Castillo. Southward of the cape the coast trends SSE. for 1 mile as far as Coronilla point; this is a double projection, fronted by clusters of rocks, some of which are uncovered. The cerro Buena Vista is a remarkable sand-hill rising abruptly from the shores of the cape, and forming near the center a conical summit 187 feet in height, visible 15 miles.

Marcos or Castillo Grande island lies $1\frac{1}{2}$ miles from the shore; the summit rises abruptly to a height of 105 feet, and has the appearance of a tower; this island is rocky, barren, and about 300 yards in diameter; the center bears E. $\frac{1}{2}$ N. from the summit of Buena Vista.

Ilha de Tierra, or Castillo Chico, lies $8\frac{1}{2}$ cables SW. of Castillo Grande; it is of circular form, 160 yards in diameter, and about 40 feet in height; the summit is covered with brushwood, and bears E. $\frac{3}{4}$ N. from the cerro Buena Vista. Both of these islands are steep-to; the channel between them is three-quarters of a mile in width, and 8 fathoms in depth; that between Castillo Chico and the coast is 150 yards wide and 20 feet deep; the latter is seldom used on account of the rocks bordering the W. side. To pass through clear of all dangers bring the E. extremity of cape Castillo to bear NW. $\frac{1}{2}$ N., and steer for it on this bearing until the summit of Castillo Grande is open to the northward of Castillo Chico.

Temporary anchorage during southerly gales may be had on the N. side of cape Castillo; the bottom is composed of sand, with occasional rocky patches, and in order to avoid letting go the anchor on one of the latter, the lead should

be examined before coming to. A good berth is in $5\frac{1}{2}$ fathoms, the summit of the cerro bearing SSW., the summit of the Castillo Grande SE. by E. $\frac{1}{2}$ E. There is also good anchorage in 3 fathoms, fine sandy bottom, in the center of the bay, formed by cape Castillo to the west and Castillo Chico islet to the southeast; here a vessel would lie at 2 cables from the nearest land, and should it come on to blow from NE. she could run out between the islet and Coronilla point. These anchorages, which were formerly much frequented, are now completely forgotten. The mariner would do well to bear them in mind, for many a vessel disabled by a pampero in the entrance of the Plata has borne up for Santa Catharina or Riode Janeiro to repair damages; others have been driven a long ways to sea, whereas had they known of these anchorages they might have run for them. The mariner should, however, be on the alert for a shift of wind to the NE., and put to sea immediately, as these winds always cause a heavy sea on this coast. There is a good landing-place in the cove formed by the cape and the shore to the westward. In the angle of the bay at the foot of the cerro there is a small stream where a supply of fresh water may be procured. There is no fuel but the brashwood on the hill.

Cape Polonio.

The coast southward of Coronilla point trends S. by W. $\frac{1}{4}$ W. $2\frac{3}{4}$ miles, as far as cape Polonio; it is a white-sand beach backed with downs 13 to 20 feet in height; these are in general barren, but on the summits of some of them there are a few clumps of bushes. The beach is steep-to; a heavy surf constantly breaks on it. Cape Polonio is a steep rocky promontory forming three points, that to the NE. being named Polonio. It is crowned with two elevations, the highest being 120 feet above the level of the sea. The N. point projects to the northward and forms a cove, where there is a good landing-place for boats. From the extremity of this point the shore of the cape trends S. for $2\frac{3}{4}$ cables, and then W. $2\frac{1}{2}$ cables; from thence it trends to NW., and connects with the sand-beach which forms the coast to the southward. There are several huts on the eastern side of the cape.

Anchorage.

In the bay between capes Castillo and Polonio there is anchorage with off-shore winds in a depth of 4 or $4\frac{1}{2}$ fathoms at half a mile, and in 7 or 8 fathoms at one mile from the shore; the bottom is a fine muddy sand.

The rocks and islets east of cape Polonio are known as the Torres islands; they are arid rocks, from 100 to 160 yards in diameter, and from 12 to 18 feet in height. They are divided into two groups. The eastern lies 1 mile and 3 cables from the shore, the center bearing E. $\frac{3}{4}$ N. from the summit of the cape; this group covers a space 3 cables in length NE. and SW. by $1\frac{1}{2}$ cables in width; the largest rock of this group is called Islote; the reef surrounding it is steep-to, with 7 fathoms close to the edges. The inner group is divided by a channel 1 cable wide and 13 feet deep. The northern part comprises the island of Seca or Rasa, several rocks, and a reef; the whole covers a space 4 cables long NNE. and SSW. by 2 cables wide; the southern part comprises the island Encantada, several rocks, and a reef, covering a circular space of $1\frac{1}{2}$ cables in diameter. The edges of both reefs are steep-to, with 5 fathoms close to them, except in the NW. end of the northern, where there is a ledge of rocks extending $1\frac{1}{2}$ cables to the westward, on which there is not less than 23 feet of water. The center of Seca island lies 3 cables from the shore, E. by N. $\frac{1}{4}$ N. from the summit of the cape; the center of Encantada lies half a mile from the shore E. $\frac{1}{2}$ S. of the summit of the cape.

The space between the inner and outer groups of the Torres islands is encumbered with a dangerous reef nearly awash, 1 cable in diameter, which shows a breaker only during heavy gales from the offing. The center of this reef bears S. by E. from the cerro Buena Vista, and E. $\frac{1}{2}$ N. from the summit of cape Polonio; the edges are steep-to, with $7\frac{1}{2}$ fathoms close by; when there is an unusually strong current the position is indicated by a ripple on the surface. This reef was discovered early in the present century by the Spanish navigator Oyarvide, but its existence was not generally known until 1862, when it was rediscovered by Captain Mouchez, commanding the Bisson, which vessel struck on it. The Spanish authorities have named the reef after the original discoverer. The French have named it Bisson after the vessel.

Temporary anchorage may be had on the NE. side of cape Polonio during southerly gales, and on the SW. side during northerly gales. Vessels which have sought shelter in either case should be ready to get under way on the slightest indication of a change to the eastward; for, with

POLONIO REEF.

an off-shore wind, both anchorages are untenable. The usual berth on the northern side is in 5 fathoms, the summit of the cape bearing SW. $\frac{1}{2}$ S.; that on the southern side is in 6 $\frac{1}{2}$ fathoms, the summit of the cape bearing ENE.

Remarks.

The passages between the Torres islands are frequented by those familiar with the locality; and in case of a vessel hugging the shore with the wind from the westward, they offer some advantages over the outside route. To pass between the inner group and the cape, bring the cerro Buena Vista to bear N. $\frac{1}{4}$ E., and steer for it on this bearing; favor the western side of the channel, because the shore of the cape is steep-to, and may be approached within a few yards. The least water in this passage is 23 feet. To pass between the Bisson reef and the inner group, bring the summit of the cerro Buena Vista to bear N. $\frac{3}{4}$ W., and steer for it on this bearing; there is not less than 6 $\frac{1}{2}$ fathoms in this passage. Coming from the northward, bring the center of Encantada island to bear SSW., and steer for it on this bearing, until the center of Seca island bears WNW., then alter the course to SE. or ESE. until clear of the passage. To pass through the latter a vessel should be well handled, and have a fair wind. The passage eastward of Bisson reef is the least dangerous; to clear it bring the cerro Buena Vista to bear N. by W. $\frac{1}{2}$ W., and pass through either to the northward or southward, keeping it on this bearing; 8 fathoms is the least water in this channel.

Polonio reef.

The Polonio reef is a dangerous ledge of rocks lying 2 $\frac{1}{4}$ miles SSW. $\frac{3}{4}$ W. from the cape, and takes its name from a Spanish vessel lost on it in 1735. The reef extends 7 cables WNW. and ESE., and the least water on it is 11 feet, while close to the edges there is a depth of 12 to 14 fathoms. The shoalest spot is marked by a breaker only when there is a sea running; it lies about one-third of the length of the reef from the western end. Between the reef and the coast there is a channel 2 miles wide, and 10 to 12 fathoms in depth; but, as there is no advantage in using this channel, the mariner should avoid it. From the southeastern extremity of the ledge the following bearings have been observed:

Cerro of Buena Vista	N. 16° E.
Eastern extremity of cape Polonio	N. 29° E.
Easternmost islet of the Torres group	N. 46° E.
Highest peak of the cerro Chafalote	N. 65° W.

It is high water, full and change, at cape Castillo at 8^h 30^m; the rise and fall of the tides depend greatly on the direction and force of the wind; southerly winds, particularly those from SE., raise the water as much as 6 to 9 feet above mean low-water level. During fine weather and moderate winds the rise is about 2 feet. The direction of the current is usually parallel to the coast-line. Variation in 1874, 7° 45' E., decreasing 4' annually.

Tides and variation.

Between cape Polonio and Punta Rubia the coast is a series of white sand-downs, between 70 and 130 feet in height; the trend is SW. $\frac{3}{4}$ W. for 20 miles. With the exception of Polonio reef there is no danger; the beach is steep-to, 10 fathoms being found 1 mile from the breakers, and 12 fathoms at 2 miles. Punta Rubia is a reddish cliff, about 50 feet in height, which rises above the white downs on each side of it; its isolation and color make it one of the most remarkable landmarks on this coast. This point is also called Isla Falsa and Punta del Rodeo; the former name is derived from its similarity to an island when seen from a distance, the latter from a farm-house which stands on the cerro Narvaez, several miles inland, visible when navigating a short distance from the beach. Between Punta Rubia and cape Santa Maria the coast curves to the westward, and forms a bay three-quarters of a mile deep and $3\frac{1}{2}$ miles wide; the shores of this bay are low, and composed of white sand.

Punta Rubia.

Cape Santa Maria is a low point, which lies 24 miles SW. of Polonio and 4 miles southward of Punta Rubia. It is called by the natives Punta de Rocha, from a town and lagoon of this name a few miles inland. The coast between the point and cape forms a bay, in which is Arrecife anchorage, well sheltered during westerly and southwesterly winds. There is also anchorage westward of the cape during off-shore winds in 6 to 7 fathoms, about three-quarters of a mile from the beach. A reef of rocks makes out 1 cable southward of the cape.

Cape Santa Maria.

Northward of the cape there are two other points, each fronted by an islet; the northernmost, Paloma, is green, between 25 and 30 feet in height, 7 cables in circumference, and bordered by a reef, showing a breaker, which extends 4 cables to the NE. and 1 cable S. of its shores. The southern islet, named Tuna or Espinosa, is smaller and lower than

Islets.

Paloma; it is sandy, crowned with a cluster of cactus, and covered with bushes. When seen from a distance both islets appear to be connected with the main-land.

Dangers.

In 1865 the British steamer *Herschel* struck the bottom in the vicinity of cape Santa Maria. In 1871 H. M. S. *Speedwell*, in searching for the danger, found the depth of $6\frac{1}{2}$ fathoms at 2 miles E. $\frac{1}{2}$ N. from the cape. Mr. Slack, master of the British steamer *La Place*, in 1872, reported a dangerous sand-bank off cape Santa Maria. The bank lies parallel to the shore, about 2 miles distant; its southwestern end, which is said to be very distinct, bears S. $\frac{3}{4}$ W. from the flag-staff at port Paloma. There appeared to be a deep channel inside of the bank.

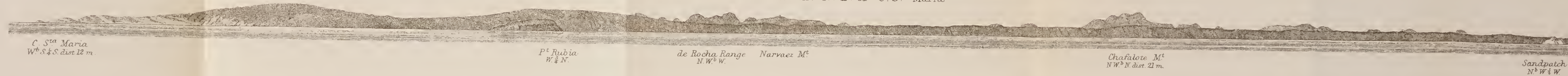
Lighthouse,
latitude $34^{\circ} 40'$
 $30''$ S.; longitude
 $54^{\circ} 9' 26''$ W.

From a round, stone tower, 125 feet in height, situated on cape Santa Maria, there is exhibited at an elevation of 132 feet above the mean level of the sea, a *revolving bright* light, visible 18 miles in clear weather. The revolution is completed in one minute. The apparatus is dioptric—first order.

Arrecife anchorage.

A ledge of rocks makes out $1\frac{1}{4}$ miles NE. by N. from the northern end of Paloma islet, and terminates in a rocky shoal, on which there is only 16 feet of water. During fresh winds from the offing the sea breaks on this shoal. The space between it and the coast is known as Arrecife anchorage; it is sheltered from all winds between SSE. round by SW. to NW. Small vessels should anchor in 23 feet of water, bottom of sand and gravel, 5 cables N. of the center of Paloma islet and 4 cables from the coast, with the conspicuous notch on the cape bearing N. 72° W. Smaller vessels may find good shelter in 16 feet of water, $2\frac{1}{2}$ cables N. of the center of Paloma islet. This anchorage may be approached round the northern end of the shoal or across the ledge; in the latter case all danger will be avoided by keeping half a mile from the NE. end of Paloma islet. NE. winds drive a heavy sea into this anchorage, which is then untenable; the full force of the sea from SE. is partially broken by the ledge, but not sufficiently to make the anchorage secure. With all winds between S. and NW., round by E. and N., there is a heavy surf on the beach, and even during off-shore winds the roller is dangerous to boats. A landing may be effected on Paloma islet during southerly winds, and usually a boat may cross over the reef connecting this islet with the coast, and enter the port of Paloma, where there is always a safe

View of the land to the Northward of Castillo Bay

View of the land to the N. E. of C. S^{ta} MariaView of the land to the S. W. of C. S^{ta} Maria

landing place to be found. The shoalest spot on the ledge bears N. 84° E. from the sand-down close to the shore, which is in line with the conspicuous notch in the hill on the cape when on this bearing. From the center of Paloma islet it bears N. 25° E., and from the extremity of Punta Rubia S. 10° W.; this spot is 1 mile from the beach opposite.

Paloma harbor, formed by a bight in the coast and the islets Paloma and Espinosa, is a circular basin about 4 cables in diameter, having a general depth of 8 or 9 feet, hard sand; it is well adapted for a few small vessels. The entrance, which is between the two islets, is narrowed by the reefs extending from either islet toward the center, and leaving a channel about 50 yards in width. There is a rock, over which there is about 7 feet of water, nearly in the center of the channel; the best water is on the Paloma side. By keeping as close as possible to the edge of the breakers on this side, you will find not less than 11 feet, and will clear the rock, which it would be prudent to buoy before entering the channel.

Paloma harbor.

The channel on the other side of the rock is not over 8 to 9 feet in depth, with an irregular bottom. The deepest part of the harbor is just within the entrance, where there is 15 feet; but the space is so limited that it will be necessary to moor with an open hawse to SE.

The British gunboat *Pert*, drawing 9 feet, entered Paloma harbor in November, 1872, and rode out a pampero there. The marks on the rocks indicate a rise and fall of about 3 feet, but the tides are very much influenced by the winds. There is a small stream of fresh water in the northern end of the harbor. An abundance of geese, ducks, swans, and partridges may be shot near Rocha lagoon, about 5 miles inland.

Northerly winds cause a fall and southerly winds a rise of tide in the vicinity of cape Santa Maria; the rise and fall are always in proportion to the strength and duration of the wind, but rarely exceed 6 feet. The reefs are usually covered at high water. The tidal currents are never very strong, but those produced by the wind are often very rapid, and require constant attention from the mariner.

Tides.

The soundings east of the cape are regular; 8 fathoms is the general depth 1½ miles from the land, and 20 to 22 fathoms at 15 miles; the bottom is composed chiefly of sand

Soundings.

and mud. There is, however, an exception to this rule; a rocky ledge one quarter of a mile in length NW. by W. and SE. by E., on which there is between 9 and 11 fathoms depth, lies $1\frac{1}{2}$ miles SE. by E. of the cape.

Remarks.

When approaching this coast from the offing it should be impossible to confound capes Castillo and Santa Maria; for in addition to the light-house on the latter there are several distinct marks which are easily recognized. In fine weather the difference of 17 miles should be a sufficient guide, but should it be cloudy cape Santa Maria may be distinguished by the sand-downs in the vicinity, which are of moderate elevation, and indented by three gaps, as seen from the northeast, the northernmost being twice as wide as the other two. Besides this the islets Paloma and Tuna are low, covered with brushwood, and lie so close to the coast that they appear attached to it unless you are close in shore. The reddish cliffs of Punta Rubia may also serve as a distinguishing mark. No high land will be visible unless it be the cerro Narvaez, 12 miles northward of the cape, and 6 miles from the coast. This cerro appears as a chain of hills, the center elevation being crowned with an estancia, or farm-house, with a single *ombu* tree near it.

Cape Castillo is visible a greater distance than Santa Maria. It may be recognized by the round white sand-hill of Buena Vista, and rising up in front of it the steep dark islet Castillo Grande, and the detached green hill of cape Polonio, 3 miles to the southward. The hills northward of Castillo appear separated and conical, while those in the vicinity of Santa Maria are united and undulating. The extremity of Castillo is abrupt, while that of Santa Maria slopes gradually to the sea. In bad weather, if no land is seen, do not get in less than 15 fathoms depth, as there is a depth of 12 fathoms close to Polonio reef.

Point Piedras.

The coast from cape Santa Maria trends W. 5 miles to the Laguna de Rocha and then SW. by W. $\frac{1}{2}$ W. 21 miles to Piedras, or José Ignacio point. It is a regular sandy beach, backed with downs from 70 to 130 feet in height, with no conspicuous object that could be used as a mark, except the wreck of a vessel on the shore about 10 miles westward of the cape. A few farm-houses, with two or three *ombu* trees near them, are seen on the summits of the hills inland. Several openings between the downs indicate the outlets to

the lagoons bordering the coast, such as the Rocha, Cardal, Garçon, Blanca, &c. As there are none of these gaps northward of Santa Maria, this feature serves as a good mark for the approach to Piedras Point. The coast is all along clear of outlying dangers, and at a distance of three-quarters of a mile from the shore there is a depth of 6 to 11 fathoms.

Point Piedras is well marked by a hill close to the shore, which rises above it, and on which there is a remarkable triangular patch of white sand fringed with verdure. It may also be distinguished by two large farm-houses, one, named Pescadores, 2 miles NW., the other 6 miles NE. of the point. The rocky shore which forms the point is two-thirds of a mile in extent E. and W., divided by a small sandy beach. A rocky ledge makes out from each end of this shore, forming a small basin in which boats may find shelter during winds from the offing; the rocks extend parallel to the coast a distance of 7 or 8 cables, with an opening between them, which is navigable by small craft. The sand-hill near the point is about 50 feet in height.

There is a plateau of rocks about 1 mile S. of the point over which there is a general depth of $5\frac{1}{2}$ to 8 fathoms, except in one spot where there is said to be a rock having only 20 feet over it. The existence and position of this rock are doubtful; there is, however, a dangerous shoal within 2 miles of the point, and it would be well not to approach it inside of this limit. Reef.

The Laguna Blanca communicates with the sea half a mile eastward of Piedras point, and San José Ignacio lagoon about 3 miles westward of it. The latter is about 8 miles long in a northerly direction, with an average breadth of 3 miles; it is said to be deep, and it has been proposed to cut a ship-canal across the narrow belt of sand separating it from the sea, so as to make a safe harbor for ships of all sizes. San José Ignacio lagoon.

The coast westward of Piedras point is a continuous sandy beach, similar to that to the eastward, as far as the entrance to Maldonado rivulet, where there is a rocky point named Maldonado. The beach eastward of the opening is clean, and forms a bend $1\frac{1}{2}$ miles deep; that to the westward is strewn with dark rocks above the water-line, and is almost straight. Maldonado point.

East point

Punta del Este, or East point, the termination of this coast and the eastern point of the estuary, is a low, dark headland making out to the southward from the end of some uniform white sand-downs. Rocky ledges front the shores of the point, and extend nearly 1 mile WSW. of it. Approaching from the offing the light-tower is usually the first object seen, unless the atmosphere is unusually clear, when the Pan Azucar and sierra de las Animas may be seen in the NW. The white downs in the vicinity of the point are not usually made out until you are close in shore.

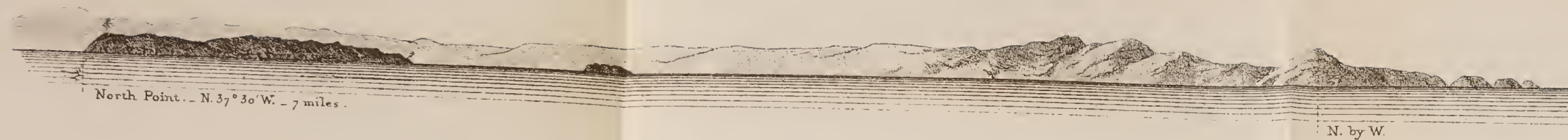
Light-house,
latitude $34^{\circ} 58'$
 $15''$ S.; longitude
 $54^{\circ} 54' 23''$ W.

On the summit of the highest down, about $2\frac{1}{2}$ cables from the extremity of East point, there is a round, white, stone tower, 95 feet in height, from which there is exhibited, at an elevation of 152 feet above mean sea-level, a *fixed bright* light, visible 20 miles in clear weather.

Lobos island

Lobos island, 4 miles SE. $\frac{1}{2}$ S. of the light-house, is 6 cables in length N. and S., by $3\frac{1}{2}$ in width; it is low, flat, rugged and surrounded by a belt of rocks which render the shores inaccessible, except at one place on the northern side, where there is a small cove and sand-beach. The highest part is near the center, 65 feet above sea-level, and may be seen a distance of 12 to 15 miles from the mast-head. A flag-staff and several huts are situated near the center of the island. Lobos is used as a station for sealing, and is said to be very much frequented by hair-seal. There are a great many rabbits on the island. From a distance it appears barren and of yellowish color, but when close by it is seen to be covered with low brushwood. The western shore is steep-to, with 12 fathoms within two cables; the southeastern side is fronted by a ledge of rocks extending out 2 cables to SE., some of which are uncovered and awash. Four cables E. of the island there is a detached reef extending $4\frac{1}{2}$ cables E. and W.; the crown of this reef is formed by two large rocks, always uncovered, situated near the western end; the sea breaks heavily on this reef. Between it and the reef bordering the island there is a channel 3 cables in width, and from $3\frac{3}{4}$ to 7 fathoms in depth; the western side is very steep-to, but the eastern side forms two ledges, one of $3\frac{3}{4}$ fathoms, the other of 10 or 12 feet close to the rocks. The breakers mark the edges of this channel, which may be used during the day in case of necessity. It is not safe to

VIEW OF LOBOS ISLAND.



VIEW OF THE COAST IN THE VICINITY OF PT NEGRA.



FLORES ISLAND.



CERRO OF MONTEVIDEO



approach the north end of Lobos island nearer than 3 cables, as the bottom is uneven, and there are several rocky heads with only 3 fathoms over them. The channel between Lobos Channel between Lobos and the main-land. and the mainland is 4 miles in width, and from 11 to 16 fathoms in depth, with a soft bottom; it is used by the majority of vessels bound into the estuary, for it is clear of danger, and, should there be light variable airs or a calm, there is plenty of room to work, and good anchorage anywhere. The cries and odor of the seals which abound on the island, chiefly on the northern and eastern sides, are often distinguished at night before the island is seen.

Before commencing the description of the northern coast Mountains. of the estuary, it is desirable to mention the hills and mountains bordering it, which are visible from the offing, and serve as landmarks for the approaches.

The sierra de Carbonero, visible 10 miles from the land, on the parallel of $33^{\circ} 45'$ S., is a chain $4\frac{1}{2}$ miles long E. and W., situated $9\frac{1}{2}$ miles inland, on the boundary between Brazil and Uruguay. The central part of the chain is the highest. Fort San Miguel stands on one of the slopes of the hills, and is very conspicuous from the offing.

The cerro de los Difuntos is a cluster of hills of nearly equal elevation, situated on the western shore of an extensive lagoon, 6 miles from the sea. When bearing NW. there is seen a remarkable cut or ravine, which serves as a distinguishing mark.

The cerro Chico or Agudo de Navarro, is a conical, barren mountain, rising from the center of a cluster of hills situated 5 miles from the cerro de los Difuntos and 9 miles from the sea, on the parallel of $34^{\circ} 07'$ S.

The cerros de Chafalote, on the parallel of capes Castillo and Polonio, 19 miles from the sea, are readily recognized by their isolation in a plain, greater elevation than the others, and peculiar outlines, which, when seen from the eastward, present three summits, the center one being the highest; on each side of these there are deep ravines.

Between the parallels of capes Castillo and Santa Maria Soundings. the depth is from 8 to 13 fathoms 2 miles from the land, and remains about the same for a distance of 16 to 18 miles off shore. The quality of the bottom changes from fine sand and broken shells to sand and mud at the latter distance.

About 20 miles E. of cape Castillo the depth is between 13 and 16 fathoms, bottom of fine sand mixed with mud.

Mountains.

The Loma de Narvaez is a chain of hills 6 miles from the sea; the center one is the highest; on its summit are the farm of Don Carlos, and a tall, isolated tree, which make it conspicuous from the offing. The Silla Chica is a small, dark-colored hill, shaped like a saddle, situated 13 miles inland. Although it is not very high, it is remarkable from the offing by its isolation and peculiar form, particularly noticeable when bearing N.

The Silla Grande is higher than the preceding, but of similar form; the northern side is steep, and rises abruptly from a low plain; it is situated 18 miles from the sea, and is most remarkable when bearing N. by W. $\frac{1}{2}$ W.

The morro San Ignacio is a lofty and remarkable summit which rises over a series of undulating hills named Asperanzas de Maldonado. It is situated 19 miles N. $\frac{1}{4}$ W. of Piedras point.

Los Tres Cerros is the name of a small hill with three summits, the western being the highest; it is situated 8 miles SW. by W. from the morro San Ignacio.

The cerro de Carape, situated 19 miles northward of East point, is of moderate elevation, and has a large rounded summit.

The morros de Maldonado are a chain of small hills extending $2\frac{1}{2}$ miles SE. and NW.; the extremities of the chain are more elevated than the center.

The sierra de la Ballena is a range of dark, rocky hills, which extend 6 miles in a N. $\frac{1}{2}$ E. direction from Ballena point. This chain rises gradually from the extremities to the center. A large patch of white sand on the southern slope of one of the hills 2 miles N. $\frac{1}{2}$ E. of the point, is conspicuous from the offing, particularly between the bearings W. and SW.

Pan Azucar.

The Pan Azucar and sierra de las Animas are the highest mountains of all this coast; they are the summits of a chain of rugged hills extending NNW. from Punta Negra; they are visible 38 to 40 miles in clear weather, and make a useful mark for vessels approaching directly from the offing. The Pan Azucar is nearly a regular cone, and rises 1,375 feet above the sea at only 3 miles from the beach; it is of granite, barren, dark, and isolated from the surrounding eminences. The height of the mountain and the diameter of the base are

about the same. The sierra de las Animas is higher than and unlike the preceding; the summit being about 1,765 feet above sea-level, flattened, and with a slight depression giving it a resemblance to the form of a saddle, particularly when seen in the WNW. The other summits of this chain are of much less elevation; those to the SE. are called cerros Ingles, Chico, and Toros; that to the NW. the cerro Betet.

Sierra de las Animas.

Maldonado bay is comprised between East point and Ballena point; the extremity of the latter is $5\frac{1}{2}$ miles NW. $\frac{3}{4}$ W. from that of the former. The bay is open to SW., the winds from this quarter driving a heavy sea into it, and were it not for Gorriti island, which affords only partial shelter, the anchorage would be untenable during southerly gales. The shores of the bay are composed of sand, backed with downs of 20 to 40 feet elevation, on which there is scanty vegetation near the sea, but gradually becoming thicker inland. The beach is generally steep, with 6 to 10 feet of water within a few yards of the surf; in some places the depth increases rapidly to 3 or 4 fathoms within 1 cable, while at others the bottom shelves gradually, and this depth is not reached up to a distance of 4 cables from the shore. The latter is generally the case on the eastern side of the bay, while the western side is steep-to. The only break in the beach is a rocky patch $1\frac{1}{2}$ miles E. of Ballena, named Granite or Arrecife point. It is bordered by a ledge of rocks extending 2 cables SSW. from the extremity; at this distance there is 20 feet of water, and close by the depth increases to 4 fathoms, and to 6 fathoms at $2\frac{1}{2}$ cables from the point. There is a pool of fresh water 50 yards from the sea, 4 cables E. of Granite point. There is a wooden pier on the shores of the bay, $1\frac{1}{2}$ miles northward of the N. end of Gorriti island, where boats may load and discharge during fine weather and a smooth sea; there are no steps, and as the pier is a good height above the mean sea-level, it is not a suitable landing for passengers. The only place which affords a safe landing at all times is a cove on the western side of East point, near the light-house. This landing is protected by the northern end of East point, which projects $1\frac{1}{2}$ cables N. of the beach, and by Gorriti island, which breaks the sea from the westward. The road from the latter landing to the town, a distance

Maldonado bay.

of 4 miles, is along the beach. Horses may sometimes be hired from the inhabitants of the point.

Gorriti island. Gorriti island is 9 cables long N. and S. and between 2 and 4 cables in width; it is lower in the center than at the ends. On the western side there is a shallow bay, with an opening of $3\frac{1}{2}$ cables and depth of $1\frac{1}{2}$ cables. The surf is usually so heavy on the beach that it is dangerous for boats to attempt a landing. The eastern shore is straight and rocky, and accessible only in fine weather. The island has been fortified, but at the present time the batteries are in ruins, and the guns remaining in them are unfit for use. The island is well adapted for exercising seamen at infantry drill on shore, and has the advantage of having no inhabitants to sell them liquor. There is a large building on the northern end, which is used for storing the skins and oil obtained from the seals that abound in the bay.

The shores of the island are fronted by a rocky and sandy shoal of less than 3 fathoms depth. Commencing from the SE. extremity, it borders the south side at a distance of 1 cable, turns to the northward and fronts the west side, the outer edge extending nearly in a straight line, from $1\frac{1}{4}$ cables W. of the southern point to 1 cable W. of the NW. point. The edge of the shoal then turns to the eastward, and passes about half a cable from the extreme northern point of the island. The shoal makes out half a mile E. by N. of this point; the edge then trends to SSW., and the shoal on this side terminates about two-thirds the length of the island from the northern point, leaving a space about 2 cables in extent where the shore is steep-to, with a depth of 4 fathoms within a few yards of it. The landing for boats is on this space. The edges of the bank are steep-to.

East bank. East bank is a rocky ledge, about 2 cables in diameter, surrounded by a bank of sand, the whole covering an irregular space 4 cables long NE. and SW., by 3 cables in width. The depth of water on the rocks varies between 9 and 18 feet; that on the bank between 4 and 5 fathoms, with occasional shoaler spots of 3 fathoms. Several of the rocks show above the surface; when the sea is smooth and water low, the shoalest part is always marked by a breaker. The edges of the bank are steep-to, with 6 and 8 fathoms within half a cable of them. The center of the rocky ledge lies 3 cables from the shore, bears SW. by W. $\frac{3}{4}$ W. from the

light-house, and is exactly on the meridian of Maldonado tower. The channel between the ledge of rocks bordering East point and the dangerous depths on East bank is about 1 cable wide, and between $4\frac{1}{4}$ and 6 fathoms in depth.

New rock is a circular ledge three-quarters of a cable in diameter, with not less than $4\frac{1}{4}$ fathoms on the shoalest part; the soundings change suddenly from 6 or 7 fathoms, all round the edges, to $4\frac{1}{2}$ fathoms on the ledge; it is dangerous only during heavy gales from the southward, and seldom shows broken water. The center of this ledge bears S. 71° W. from the light-house and S. 10° W. from Maldonado tower. It lies one mile and 2 cables W. $\frac{1}{4}$ S. from the extremity of East point. The channel between this ledge and East bank is half a mile wide, and not less than 7 fathoms in depth. New rock.

Monarch rock is a rocky head with only 18 feet of water over it, surrounded by a cluster of rocks, 4 to 5 fathoms below the surface, the whole covering a space 2 cables long SE. and NW., by $1\frac{1}{2}$ cables in width. The shoalest spot bears NW. $\frac{1}{2}$ W. from the light-house, and SW. by S. from Maldonado tower. It lies half a mile NW. by W. $\frac{1}{2}$ W. from the NW. point of Gorriti island. The space between the edge of this bank and of that surrounding Gorriti island is 3 cables wide, and from $5\frac{1}{2}$ to 7 fathoms in depth. The dangerous part is so small that the sea never breaks on it; with a very heavy southerly gale the surface is broken, but not enough to be easily remarked. Monarch rock.

East of Gorriti island, and between the bank which makes out from the NE. end and that fronting the shores of the bay, the depth varies between 4 and 5 fathoms, except in two places. One of these has 3 fathoms of water over a space 1 cable long and half a cable wide; it lies S. $\frac{1}{2}$ E. from Maldonado tower and E. $\frac{1}{2}$ N. from the north extremity of Gorriti island, about midway between the NE. end of the island and the opposite shore. The other is $1\frac{1}{2}$ cables long by 1 cable wide, and has 3 fathoms of water over it, except in one place, near the western end, where there is 13 feet; this spot bears N. $\frac{1}{2}$ W. from the light-house, and E. by S. from the northern extremity of Gorriti island. Both of these shoals should be carefully avoided when approaching or leaving the anchorage.

Leading marks. The leading mark to clear the south edges of New rock and East bank is with the extremity of East point bearing E. by N.

The leading mark to pass between East bank and East point is with the NE. end of Gorriti island bearing NNW. $\frac{1}{8}$ W. Approaching this channel from the eastward close with East point to within 2 cables when abreast of it, and haul up as soon as the NE. end of Gorriti is open of the western side of the point; the bearing will be on about the time the course is changed to NNW. $\frac{1}{8}$ W. The space is narrow and requires prompt handling to pass through it safely. None but steamers should attempt it.

To pass between East bank and New rock bring the NE. end of Gorriti island in line with the pier on the shores of the bay bearing N. $\frac{1}{2}$ W., and steer for them on this bearing until the light-house bears E.

To pass to the westward of New rock bring the SW. side of Gorriti in line with Maldonado tower bearing N. by E. $\frac{1}{8}$ E., and steer for them on this bearing until the light-house bears E.; then steer in about midway between Gorriti island and the western side of East point.

To pass between Gorriti island and Monarch rock bring the dome of the cemetery in line with the pier, bearing N. by E. $\frac{3}{4}$ E., and steer for them on this bearing until the north end of Gorriti island bears SE. by E.; then change the course to E. until the anchorage is reached.

To pass to the westward of Monarch rock bring Maldonado tower in line with the pier bearing NE. $\frac{1}{4}$ N., and steer for them on this bearing until the northern end of Gorriti island bears SE. by E.

The line of bearing between the light-house and the house which stands close to the pier is N. by W. $\frac{3}{4}$ W. and S. by E. $\frac{3}{4}$ E.; it is on this line of bearing that vessels should pass between Gorriti island and the shores of the bay; the least depth is $4\frac{1}{2}$ fathoms.

Anchorages. The anchorages in the bay are on the northern side of Gorriti island during southerly gales and on the eastern side during westerly gales. The former drive a heavy sea into the bay, between East point and the island; with gales from the SW. the sea is dangerous in the latter anchorage. Before letting go the anchor the lead should be carefully examined, so as to avoid anchoring on one of the many rocky

patches found on the eastern side of the island. Where these do not exist, the bottom is composed of a thin layer of sand, covering a stiff muddy substance, which allows the anchors to take a good hold. Vessels should moor, open hawse to SW., if intending to make a long stay.

The town of Maldonado is situated three-quarters of a mile NE. of the pier. The only parts of it visible from the bay are a tower and the cemetery dome. The former is a square, white building, with a reddish base, which stands on rising ground, about 250 feet above sea-level; the latter is not so conspicuous, but can be distinguished; it is situated about midway between the pier and the tower, and to the westward of the latter.

The town was founded in 1724, and for a long time was the capital of the province of the same name; during the last 10 years it has rapidly declined in commercial importance, and in August, 1871, appeared to be almost deserted. At this date, the number of inhabitants was estimated at 800; there appeared to be no business whatever transacted in the town, and the inhabitants seemed driven almost to desperation by the unsettled condition of the country.

The department of Maldonado has an area of about 5,000 square miles; the limits of its sea-coast are from the Chuy river, northward of East point, to Solis Grande river, westward of Animas point, within the estuary, a distance of about 150 miles, including the sinuosities. The inhabitants were estimated at 15,500 in 1860. The most important town is that of San Carlos, 8 miles farther inland than Maldonado. The industry of the department is confined to raising cattle, horses, and sheep; the estimated number of these in 1871 was 600,000 head, of which the large majority were cattle and sheep. Some revenue is derived from the sea-wolf and seals, which abound along the coast and in the neighborhood of capes Castillo and Polonio, and the shores of Lobos island.

Water is the only thing that could be readily obtained at Maldonado in 1871. There is a small running stream passing close to the town and emptying into the bay about 15 yards east of the pier; the water of this stream is pure and good, if taken some distance from the beach; the best plan is to land casks on the pier and roll them to the stream. There is always a heavy surf on the beach during the south-

Maldonado
town.

Supplies.

erly gales, and for several days after they have ceased. Fresh beef and mutton may be had if a day's notice is given; poultry and other live stock are cheaper than at Montevideo. In the season the neighboring country abounds in quail and partridges, which may be shot with ease and without dogs.

Pilots.

Pilots for Montevideo and Buenos Ayres cruise in schooners and sloops in the vicinity of Maldonado; they frequently anchor in the bay. Some of the men reside on the point, and, in case of necessity, one may always be had either from Maldonado or the houses close to the light-house.

Ballena point.

Ballena point is a dark, rocky projection, which makes out from the foot of some sandy hills extending 3 or 4 miles inland. The surface of the point has the shape of a saddle when seen from the eastward and westward. The Pan Azucar, the depression forming the saddle, and Monarch rock, are on the line of bearing SE. by E. $\frac{1}{4}$ E. and NW. by W. $\frac{1}{4}$ W.

The extremity of the point is fronted by a ledge of rocks, portions of which uncover at low water; this ledge extends 2 cables southward of the point; it is steep-to, with 4 to 6 fathoms close to the edge about one-quarter of a mile from the shore.

Tides and currents.

The tides of Maldonado bay are influenced by the prevailing wind, southerly winds producing a rise, northerly winds a fall; the rise or fall usually precedes the wind, and sometimes serves as a means of foretelling its approach. Admiral Fitz Roy (R. N.) observed that the temperature of the water falls when a southerly gale is approaching, and rises when a northerly gale is approaching; this has since been confirmed by subsequent observers, and may be regarded as an established rule, subject, however, to some exceptions. In the limits of the bay, the usual direction of the flood is from NW. to SE. The waters seem to flow into the bay between the northern end of Gorriti island and Ballena point, and flow out between the southern end of Gorriti and East point. The direction of the ebb is opposite to that of the flood. Eddies are formed along the shores of the island and bay; these are always stronger with the flood than with the ebb, and are generally in proportion to the strength of the tidal current. The mean

difference in the level of the sea is $6\frac{1}{2}$ feet; the maximum is 10 or 12 feet.

The indentation of the coast between Ballena and Rasa points is known as Potrero bay; it takes the name from a lagoon which has an outlet near the middle of the bay. The shores are steep-to; the depth of water on the line of bearing between the points is 6 and 7 fathoms; the bottom is coarse sand and gravel. Vessels bound to sea, caught in a northerly or easterly gale, will find good shelter under Ballena point, if they cannot reach Maldonado bay.

Potrero bay.

Negra point is a bold promontory 3 miles in length E. and W., forming three points with sandy shores between them. The eastern point is named Rasa, (Level,) the middle one, Negra, (Black,) and the western, Iman, (Magnet;) they are backed with the high lands which rise rapidly to form the Pan Azucar and cerro de las Animas. The soundings off this headland range from 4 to 5 fathoms close to the rocks, deepening rapidly to 7 and 10 fathoms.

Negra point.

Burros (Donkey) point is $2\frac{1}{2}$ miles NNW. of point Iman; the intervening shore curves to the eastward, forming a bay known as English port, which is well protected from easterly winds. On the line of bearing between the points the depth is 4 to 5 fathoms, and in the bay it is 19 to 23 feet. Five miles NW. of Burros point there is a low projection, fronted by a reef which borders the shore for 2 miles, named Cerro point. West of this reef the shore becomes clear of all rocks as far as Afilar point.

English port.

Afilar point is 7 miles to the westward; the river Solis Grande empties into the sea between these points. Afilar derives its name from some conical hills close by, which contain quarries of whetstone. Two of these hills, higher than the others, are conspicuous from the offing. There is a signal-station on the summit of the northern hill, which is the highest of the range. A spur of the southern hill forms the point, which is low, projects to SSW., and is bordered by rocks, which are steep-to, with 5 fathoms of water close by. The surf is high on this part of the coast.

Afilar point.

Solis reef, a cluster of rocks 4 cables in length E. and W., by 2 cables N. and S., is covered at high-water, and always marked by a breaker; it lies under the following bearings, taken from the crown of the reef: Afilar point,

Solis reef.

N. 60° W.; Negra point, S. 60° E.; summit of the Pan Azucar, N. 86° E.

Aflar reef. Aflar reef, situated $1\frac{1}{2}$ miles S. $\frac{1}{2}$ W. of the point of this name, is uncovered except at very high water, when it shows a breaker; it is nearly 1 mile in length, N. and S., including the shoal ground surrounding the rocks. The channel between it and the point has a depth of 3 fathoms, but only in the middle; the navigable part is not over a cable in width.

Piedras Negras point. The next salient point, situated 10 miles W. $\frac{1}{2}$ N. of Aflar, is named Piedras Negras, from the dark rocks of which it is formed. The intermediate shore forms a bight, and is an irregular sand-beach, except in one place, where there is a double projection of dark-colored rocks, with a strip of sand-beach between, named Pedro Lopez point. The Solis Chico river empties into the sea about midway between this point and Piedras Negras. The latter is also a double projection, with a narrow strip of sand between; it appears to be fronted with a ledge of rocks, some of which are above the water, extending out a distance of 1 mile to the E., S., and W. There is said to be a navigable channel 3 fathoms in depth between the rocks and the point, but it is suitable for boats only.

Santa Rosa beach. For 19 miles westward of Piedras Negras the shore is an extensive gravel-beach as far as Carretas point; the trend of the coast is very irregular, but the beach is clear of dangers, and steep-to, as far as the meridian of Flores island. Santa Rosa bay lies immediately north of Piedras Negras point; it has an opening of $1\frac{3}{4}$ miles, and depth of 3 to 4 fathoms, with a clean, sandy shore, where boats may land during fine weather and off-shore winds. There is a stream of fresh water emptying into this bay.

The sea is always heavy off this coast during southerly gales, and the currents often set rapidly toward the land; from these causes many vessels have been lost in this vicinity, and their crews have perished in the heavy surf.

Pando river. The Pando river empties into the estuary 7 miles westward of Piedras Negras point. On its right bank, about 5 miles inland, is the town of Pando, a place of no commercial importance.

Carretas point. Carretas, or Buceo point, is a low, rocky, projection crowned with a single *ombu* tree, which serves as an excel-

lent mark. This point lies 7 miles NW. by W. $\frac{1}{2}$ W. of Flores light, and 5 miles E. by N. $\frac{3}{4}$ N. of Brava point.

Point Brava is low and salient, terminating in a rocky ledge which makes off half a mile to the southward, where there is a detached rock awash, and close to it a depth of 4 fathoms, bottom of mud. The point is backed by a hill of moderate elevation, having on its southern slope a large, white building. The village of Buceo, on the shores of a small cove to the northward of the point, will also serve as a landmark when approaching it from the eastward.

The bend formed by the coast between Buceo and Brava points is named Basuras bay; the shore is a series of rocky points intersected with strips of sandy beach forming coves, each having a name known only to the natives. Several small streams empty in this stretch of coast. There are three islets, very close to the land, which are not distinguished unless you are well in shore. One of these, the largest, named Meldroza, shelters an anchorage for small vessels, in which there is a depth of 20 feet.

Flores island, readily recognized by the light-house, lies 56 miles W. $\frac{1}{2}$ N. from Lobos island, and directly in the track of vessels bound to Montevideo from sea. The island is 7 cables in length in a direction northeast and southwest, and 2 cables in breadth; there is a slight elevation in the middle, and one at either end, that to the southwest being the highest; the land uniting these being very low, it is frequently overflowed, and the island is then seen as three islets. The shores are steep, except to the northeast, where a reef makes off to NW. a distance of half a mile. There is good anchorage all around the island, but the best berth is with the light-house bearing ESE. half a mile off, in 5 fathoms, mud bottom. Small vessels lie in a creek in the western end of Flores.

On the highest part of the island there is a white stone tower, 65 feet in height, which exhibits, at an elevation of 104 feet above the mean level of the sea, a *revolving bright* light, visible 12 miles in clear weather. The light revolves in one minute; the apparatus is dioptric, second order.

Variation in 1874, $9^{\circ} 00'$ E. An impression has prevailed among mariners that the lights of the Plata are not well attended, and are, therefore, unreliable; this is unjust to the keepers; for personal observation has proved that the re-

Brava point.

Basuras bay.

Flores island.

Flores light-house, latitude $34^{\circ} 56' 55''$ S.; longitude $55^{\circ} 52' 22''$ W.

Variation.

port is without foundation, in fact. Doubtless the lights are frequently invisible, but this is the result of a haze which obscures the horizon, leaving the sky overhead clear and bright.

Dangers.

About three-quarters of a mile SW. $\frac{1}{2}$ W. of the light-house there is an isolated rock, or ledge of rocks, extending about 1 cable ESE. and WNW., half a cable in breadth, and surrounded by a depth of 5 fathoms, soft, muddy bottom, on which two English ships of war have struck. The shoalest part is said to have a depth of not less than 16 feet, and to consist of a rock 8 to 10 yards in circumference, on which H. M. S. Cumberland, in 1857, struck and remained aground several hours.

The space comprised between north and south lines drawn through Flores light-house and Buceo point, and an east and west line drawn through Flores light-house and the coast to the northward, has recently been accurately surveyed by the officers of the U. S. S. Wasp, and instead of the numerous dangers which were formerly said to exist, there are found to be only the following, the positions of which are no longer in doubt :

Sara bank.

Sara bank is a rocky patch situated 4 miles W. by N. $\frac{3}{4}$ N. of Flores light; on which there is an average depth of 12 to 14 feet, but as little as 9 feet over the western end; its greatest diameter is 500 yards. The soundings decrease rapidly from 4 and $4\frac{1}{2}$ fathoms, muddy bottom, to 3 fathoms, rocky bottom, at a distance of 200 yards from the edges of the shoal, giving scant warning to a vessel moving rapidly.

Bump shoal.

Bump shoal lies $5\frac{1}{2}$ cables N. of the preceding, and 4 miles 3 cables NW. by W. of Flores light-house. Its greatest diameter is 300 yards; the general depth on the shoal is 9 to 12 feet, rocky bottom; but there are some pointed rocks with only 4 feet over them at ordinary stages of the tide. This spot rarely breaks, and is dangerous; it has, doubtless, heretofore, been considered as a part of Carretas reef, from which, however, it is distinctly separated by a channel 500 yards in width, having not less than 3 fathoms depth over a soft, muddy bottom.

Carretas reef.

Carretas, or Pipas reef, is a cluster of rocks rising to a height of 10 feet or more above the general level of the water, and rarely, if ever, being covered; these extend over a space 4 cables in length east and west, and about 1 cable

in breadth. The largest and highest, named Mark rock, is also the easternmost; it stands quite alone, the rest of the group being visible to the left, but clearly separated from it. The rock is dark, showing well against the white beach, and is visible from the deck of a vessel a distance of 3 miles during the day, appearing from this distance to be on the beach, from which it is really $1\frac{1}{2}$ miles distant. Its position is short 5 miles NW. by W. $\frac{1}{2}$ W. from Flores light-house. Northward of the rocks the bottom shelves gradually to a depth of 12 feet at a distance of 300 yards, where it shoals abruptly, and there is a rock just awash situated 400 yards NW. by N. of Mark rock. Near to the southern and western edges of the reef there are one or two detached rocks below the surface; and a ledge of rocks awash extends 200 to 300 yards E. of Mark rock. The southern edges are steep-to, with 4 and $4\frac{1}{2}$ fathoms, muddy bottom, within 100 yards; on the northern side the change of depth is not as abrupt, but the bottom is not sufficiently shelving to give warning.

Forest King reef is a long, narrow ledge of rocks, extending half a mile in a direction NNW. $\frac{1}{2}$ W. and SSE. $\frac{1}{2}$ E. Forest King reef. The general depth is 7 to 9 feet, but there are shoaler spots where there is from 4 to 6 feet only at low water. The position of the southern rock is $5\frac{3}{4}$ miles W. by N. $\frac{1}{4}$ N. from Flores light-house, and $1\frac{1}{2}$ miles SW. by W. from Mark rock. Between the northern rock and the edge of the shoal surrounding Luz island, off Buceo point, there is a channel half a mile in width and 4 fathoms in depth, over a muddy bottom, through which a vessel may pass in case of necessity. Between the eastern edge of Forest King and the western edge of Carretas there is a channel $1\frac{1}{3}$ miles in width with not less than $3\frac{1}{4}$ fathoms. With one exception, Forest King reef is the most dangerous; on one occasion, the surveying boats pulled directly across it, only one of them obtaining soundings in rocky bottom. A vessel might strike the reef without the slightest warning from the lead or otherwise, as a depth of 4 fathoms, muddy bottom, exists within 200 yards of the rocks.

Luz islet lies 1,000 yards SE. by S. of Carretas point. Luz islet. This is the crown of a narrow reef of rocks which commences within 100 yards of the point, and extends to SE. by E. a distance of half a mile; the rocks usually visible extend

about 400 yards, but the bottom for a quarter of a mile on all sides is rocky and uneven, with depths ranging between 15 and 20 feet. Luz islet is usually about 5 feet above the water-level, but in high tides it is awash. There is a boat-channel between the extremity of the point and the northern edge of the reef.

Remarks.

The soundings, except in the immediate vicinity of the reefs, are very regular, the depth decreasing gradually from $5\frac{1}{2}$ fathoms, near Flores island, to 3 fathoms, which in ordinary stages of the river can be carried to within 400 yards of the beach. The bottom is mud, generally soft, and affording good anchorage.

In beating in or out of the river, it is not advisable to bring Flores island to bear southward of E. If, however, it is desired to stand to the northward of this bearing, the light-house and Mark rock afford good marks for cross-bearings when you are westward of the island. The mainland for a considerable distance eastward of Flores is devoid of trees. The first tree seen stands out prominently. The next, to the westward, is tall and very full, resembling a large oak; it stands on the top of the low range of hills, showing out well against the sky, and at its foot on either side is a low clump of bushes. On the slope of the hill, S. $\frac{1}{4}$ W. of the foregoing, there is a smaller tree, much resembling it; this is below the line of the top of the hills, but shows distinctly by reason of its dark foliage. The two latter trees form a range, to the eastward of which there is no danger. On a cloudy day the range can be made out a distance of 7 miles. There are other ranges, useful to those familiar with the ground, but not likely to be gotten hold of by a stranger.

The direction of the current is always more irregular north of Flores than to the southward; and the set is always stronger; it is therefore no advantage to a vessel beating in or out to stand to the northward of the island.

Buen Viaje
shoal.

The Buen Viaje shoal is nearly circular, about half a mile in diameter, and consists of a ledge of rocks, some parts of which are often awash, and with very low tides entirely uncovered. This danger is well marked by a wreck, the steam-drum of which always shows above water, and by three buoys; that on the eastern end is a bell-buoy moored in 4 fathoms, under the following bearings: Cerro light N. 63°

37' W., Brava point S. 85° 26' W., Flores light S. 89° E. The buoy on the western edge, moored in 23 feet, lies 5.2 cables N. 75° 30' W. from the bell-buoy; and that on the northeastern edge, moored in 24 feet, lies 5 cables N. 57° E. from the bell-buoy. A rocky patch lies half a mile W. $\frac{1}{4}$ S. from the western extremity of the shoal. The position of the wreck is 1½ miles E. of the extremity of Brava point.

The coast between Caleta or Sarandi point, the southwestern extremity of the peninsula of Montevideo, and Brava point, forms a bight, with an opening of 3 miles and depth of 1 mile, the shores of which are rocky and broken into several coves. In the middle of the bight there is a small sandy cove named Caleta Chica, or Porcillos. The western point of this, named Perez, and another point, named Gabriel, are the only ones fronted with reefs, and these do not extend beyond 1 cable from the shore; Porcillos cove is defended by a battery, named Santa Barbara, situated on a hillock near the beach.

Caleta point.

The soundings along this shore are regular; 14 to 15 feet depth is found close to the rocks, and 16 to 17 feet within 2 cables. The bottom is muddy, except in one spot, where there is a rock with 3 to 4 feet less water over it than in the vicinity, and with only 13 feet at mean low-water. This danger is marked on the latest charts of the bay of Montevideo, but appears to have been ignored by the pilots, several of whom have been seen to steer directly for it with vessels of heavy draught. It lies under the following bearings: S. of the harbor light on the end of the breakwater, SW. from the dome of the cathedral, which is lighted up at night, and SE. $\frac{1}{2}$ E. from the Cerro light. The space over which there is only 13 feet depth is said to have an extent of 10 yards, and the whole space in which the bottom is rocky does not exceed 50 yards. The depth all round it is 17 to 18 feet at mean low-water.

Soundings.

MONTEVIDEO BAY AND CITY.

San José point, 2 cables N. of Sarandi, is the eastern limit of Montevideo bay. Between these points the bottom is foul, and the depth very irregular within 1½ cables from the shore; outside of this limit there is 15 to 16 feet, over a mud bottom; inside of it there are several rocky patches,

San José point.

with 8 to 10 feet over them, surrounded by a muddy bottom. Two of these are detached from the main reef bordering the shore. The southern, named Hydra, covers a space about 50 yards in diameter, the center bearing SSW. $\frac{1}{2}$ W., distant 2 cables from the harbor-light on the breakwater. It is separated from the main reef by a space 30 yards in width and about 15 feet in depth. The other rock, named Griffon, lies 1 cable N. of the Hydra, and $1\frac{1}{2}$ cables SW. $\frac{1}{2}$ W. from the same light; it is separated from the main reef by a channel 15 feet in depth, 40 yards in width, and from the Hydra by a space half a cable in width and 14 feet in depth. Both of these rocks are marked by spar-buoys, which are intended to lie just outside of them, but are rarely in position.

Breakwater.

San José fort stands three-quarters of a cable from the shore, and is a conspicuous mark during the day. A breakwater extends about 250 yards to the NW. from the fort, and is in course of extension 300 yards farther in the same direction. The submerged parts form a reef, the extremity of which is marked by a spar-buoy.

Lights.

On the end of the finished part of the breakwater there is an ordinary gas-lamp, from which there is exhibited, at a height of 14 feet above the mean level of the water, a *fixed red* light, visible 3 to 5 miles, but difficult to distinguish from the lights in its vicinity. The extension of the breakwater trends N. 39° W. from this light.

The eastern tower of the cathedral shows a *fixed bright* light, at an elevation of 147 feet above mean sea-level. This light is the dial-plate of the clock, illuminated by gas, and should be seen a distance of 10 miles in clear weather.

Variation.

Variation in 1874 $9^{\circ} 00'$ E.

Lobos point.

Lobos point, the western limit of Montevideo bay, lies 2.1 miles W. $\frac{1}{4}$ N. from Sarandi point; it is a rocky projection extending $3\frac{1}{2}$ cables to the southward. A reef of rocks fronts the point, and is connected with it by a narrow strip of sand, with 6 feet of water over the shoalest part. Some of the rocks are awash at low water; one cluster named Piedras Blancas, is always visible. The extremity of the reef is marked by a bell-buoy, moored in 20 feet depth, half a mile S. 1° W. from the Cerro light, and S. 79° W. of the cathedral light.

It is proposed to make this reef the base of a breakwater,

and to build a slip on the northern side, where there is a deep pocket protected by the southern part of the reef. In connection with this it is intended to construct a railroad around the shores of the bay. The recent disasters to shipping, together with the increasing number of steamers visiting the port, have caused the inhabitants to turn their serious attention to a subject in which they are so deeply interested; and this will probably result in the construction of a harbor of some kind.

The Cerro, or mount, from which the city derives its name, is the distinguishing mark of the port. It rises on the western side of the bay to a height of 463 feet, at less than a quarter of a mile from the beach. On the summit there is a fort, which is crowned with a tower, from which there is exhibited, at an elevation of 486 feet above mean sea-level, a *fixed* and *flashing* bright light, visible from 20 to 25 miles, dependent on the condition of the atmosphere. The flash is seen *fifteen* seconds; it is preceded and followed by a short eclipse; and the interval between these is *three minutes*. The flash only is visible beyond a distance of 5 or 6 miles, and this has been seen as far as 30 miles. The Cerro is the most conspicuous mark on the northern coast of the estuary; the eastern slope is being rapidly covered with houses, and in the event of the construction of a port on this side of the bay, the entire commercial business will doubtless be transacted on this side.

Montevideo bay is an irregular space $1\frac{1}{2}$ miles in diameter from SE. to NW., and $2\frac{1}{2}$ miles from SW. to NE.; it is open to the southward, but there is shelter in it for vessels of a moderate size from all winds from W. round by N. and E. to SE. The eastern shore is composed chiefly of sand, formerly a shelving beach, but now almost entirely built up in wharves and piers. The western shore, along the foot of the Cerro, is rocky, and here also there are a number of wharves of recent construction. The depth of the bay northward of the line of bearing between the points of entrance decreases regularly from 16 to 12 feet in the first half mile; thence to the northward the decrease is more gradual, and the average depth at 2 cables from the natural shore in the head of the bay is about 6 feet. The bottom is a thick layer of mud over a surface of rock which in some places rises to and above the level of the water.

Cerro light-house, latitude $34^{\circ} 53' 15''$ S.; longitude $56^{\circ} 14' 36''$ W.

Montevideo bay.

- Ratones island.** In one place these rocks rise and form an island, named Ratones, situated $1\frac{1}{2}$ miles NW. of San José fort, and E. of the Cerro light-house. This island is low, fringed with reefs, some parts of which are detached and occasionally uncovered. There is an old fort and barracks on the island used chiefly as a place of confinement for political prisoners. On the western side a jetty has been constructed which affords protection to the landing-place. Ratones is an excellent place for establishing, by observation, the rate of chronometers. The position will be found in the table.
- Rocks.** Within 2 cables of the shores of the bay, northward of the city and round to Lobos point, there are several clusters of rocks all beyond the navigable limits. Those in the navigable part of the bay are: Sarina, situated $4\frac{1}{2}$ cables SSE. of Ratones island, is 1 cable long NW. and SE., and half a cable in breadth, with a general depth of 3 feet, except near the southern end, where there is a rock awash at low water.
- Sarina reef.** Two spar-buoys mark the position of this reef. Triton, situated 4 cables SE. of Ratones, is very small, with 4 to 6 feet water over a rocky bottom, and is not marked by buoys. There is a rock, sand-bank, or wreck, on which a vessel grounded in 1865, situated $1\frac{1}{2}$ cables NE. $\frac{1}{4}$ N. from the shoalest part of Sarina. On the eastern side of the bay, three-quarters of a mile NNE. of the mole light, and half a mile from the shore, there is a group of rocks always covered, but marked by 2 spar-buoys; these are known as the Familia rocks. There are two other rocky patches, one $3\frac{1}{2}$ cables eastward of Ratones, the other the same distance northward of it, which have about 7 feet over them, but are out of the way and have no marks.
- Triton bank.**
- Familia rocks.**
- Anchorage.** The usual anchorage-ground for vessels drawing 20 feet is with the Cerro light bearing NW. by W., and the cathedral tower NE. by N., where there is never less than 20 feet depth, and the bottom being very soft mud, there is no danger of injury from swinging over the anchors. Deeply laden merchant-ships usually run in until they stick fast in the mud, particularly if the water is low. Vessels of light draught should anchor as far inside of the bay as circumstances will permit, in order to be sheltered from easterly and westerly gales. The U. S. S. Portsmouth, drawing $17\frac{1}{2}$ feet, was moored, on several occasions during 1870 and '71, within two cables of the end of the finished breakwater

where the charts show a depth of 15 to 16 feet. During 90 days of her stay in this anchorage, at different times, soundings were taken alongside every hour, and the least depth found was 18 feet, the greatest 24 feet. At one time 17 feet depth was found where the charts show only 15 feet; and it was asserted by the pilots and port officers that they had never seen the river any lower than it was on this day. It would appear from this that the depth of the port, so-called, has either increased since the last survey, or, what is more likely, the soundings given on the chart have been reduced to extreme instead of mean low water.

The anchorage for vessels of war is outside of the line of bearing between Ratones island and the breakwater light. It would be better for them to anchor in the roads in order to be out of the way of the merchant-vessels, to avoid the risk of being fouled by other ships dragging during the southerly gales, and to be beyond the reach of the disagreeable and unhealthy odors from the city.

All vessels lying in the bay should be moored with an open hawse to SSW. or S., 45 fathoms of chain on each anchor, the best bower to the westward, there being less room to veer chain with a gale from this quarter. Vessels in the roads usually lie to a single anchor with a long scope of chain so that they may ride to the bight of the chain, ordinarily, and thus avoid fouling the anchor. Vessels of war should examine their anchors frequently during the stormy months, especially when the change of current has been frequent.

The holding-ground is much better in the roads and in the western part of the bay than it is in the port, where the bottom is very soft. The anchorage near Sarandi point is not considered safe on account of the ground-swell in this locality, and in case of a pampero the vessel would be on a lee-shore. Store-ships and vessels remaining in one anchorage for a long time should have their bowers backed with stream anchors or heavy kedges.

Southerly gales raise the waters of the bay 3 feet and more usually before the sea rises; there is, therefore, no danger of injury to the bottom if a vessel is anchored in a depth equal to her draught. A strong current sets around San José point a few hours after the commencement of a SE. gale; this causes vessels in the vicinity to swing across

and lie in the trough of the sea, which, although very uncomfortable, is much easier on the chains. During SW. gales the strain on the chain is unsteady, and many vessels have parted from this cause. An anchorage off San José point should, therefore, be avoided.

Landing-places. The landing-place for boats is in front of the office of the captain of the port, immediately to the northward of the breakwater; it is well sheltered from a southerly sea, but exposed to the irregular broken swell which is driven in by winds from WSW. to NW. Boat-service in this port is very hard on the boats and their crews, especially when the vessel is anchored in the roads. The loss of life from the capsizing of boats is alarmingly great, and too much caution cannot be used to avoid it. Regularly equipped life-boats should be used to the exclusion of all others! Whenever a boat is caught on shore by a gale all the gear should be removed and stored, and the boat hauled up on the landing just inside of the breakwater. The number of "beach-combers" at Montevideo is proportionately greater than in any other port in South America.

Lighters. Merchant-vessels are loaded and discharged by lighters, of which the number is very great. The city is well supplied with wharves and steam-cranes.

Tugs. There are several tugs employed in the bay; one of these may always be had; and it is recommended to take one whenever it is necessary to shift the anchorage. The great evil of Montevideo is an overcrowded state of the port, collisions being of very frequent occurrence. Many of these would be avoided if tugs were more generally employed, the harbor being too shallow and contracted to admit of prompt handling under sail.

Tides and currents. The rise and fall of the waters of the bay and the currents in the vicinity are mainly dependent on the force and direction of the wind which is prevailing in the estuary at the time. The phases of the moon have no apparent influence on these changes; and, as a rule, it is impossible to foretell them with any degree of accuracy. During a stay of several months, at different seasons of the year, at anchor in different parts of the bay and roads, the currents and general movement of the waters were closely observed, with the view of determining the tidal hours, &c. It was found that the greatest difference in the depth of water alongside, from

hourly observations during 90 days, was 7 feet, and this only on one or two occasions. Southerly winds cause a rise which sometimes precedes them several hours; northerly winds produce a fall, which does not commence until the breeze sets in. The greatest rise was caused by a gale from SSE. to SE.; the greatest fall by a gale from WSW. to WNW. As an evidence of the uncertainty of the currents and the rise and fall of the tide, it was found that the waters of the bay were frequently very low during a moderate prevailing wind from SE.

The water is sometimes higher along the eastern shore than it is on the western, and *vice versa*. There is a noticeable difference in the rise and fall along the northern shore of the estuary eastward of Montevideo to that in the bay. An inshore current is often seen setting in an opposite direction to that in the estuary along the shores of Montevideo bay and the vicinity. Great care is necessary in standing out of the bay after a pampero has been blowing, as a strong current setting to NW. is often experienced directly after clearing Sarandi point.

All articles necessary for the equipment and repairs of vessels may be obtained in Montevideo, heavy machinery and large spars excepted. Coal for steamers averages in price \$12 a ton of 2,240 pounds. Galley coal is usually charged for at the rate of \$15 to \$20 a ton. Wood is very scarce and expensive, the price ranging from \$25 to \$30 a cord. Water is brought alongside in lighters built especially for the purpose; the price ranges from three-quarters of a cent to 1½ cents a gallon. Fresh beef and mutton are very cheap. Vegetables and poultry are moderately dear. Fruit and game in the season are plentiful and cheap. The markets abound in good things, which may be bought at reasonable rates.

Supplies.

The dry-dock at the foot of Florida street, near the gas-works, which was originally designed for a basin to discharge colliers, has recently been opened for the accommodation of ships, and several vessels have received important repairs while in it. The dimensions of the basin admit vessels 275 feet in length and 45 feet breadth of beam; the depth over the sill varies from 14 feet upward, according to the state of the tide. The excavation is mostly out of the solid rock, and it is to be continued and the capacity of the dock increased. Mushroom anchors are planted off the entrance to facilitate hauling

Dry-dock.

in and out of the dock. The approaches are good, and any vessel drawing 15 feet, or less, may ride out a gale at anchor within 1 cable of the gate. The prices charged for the use of this dock are by no means exorbitant considering the prices of labor in Montevideo.

Defenses.

The forts in the vicinity of the city are old and dilapidated; they contain few guns of any description, and none of the more recent patterns, and are entirely incapable of successfully defending the port against a fleet of wooden vessels. A line of fortifications extends across the neck of the peninsula; these are of recent construction, and are intended to defend the city against the revolutionary parties which are always to be found in the country. The army is in a very

Army.

disorganized condition, owing to these very frequent revolutions, and is composed chiefly of officers. Adventurers of all nations, deserters from vessels of war and merchant-vessels, and conscripted natives make up the infantry, but the cavalry is composed chiefly of the native herdsman, who spend their lives on horseback, and make excellent marauders, although indifferent soldiers. The navy consists of two

Navy.

steam gun-boats, which were formerly merchantmen, and several tugs and steam-cutters. The number of officers is said to equal, if not exceed, the number of men, but they appear to be employed as customs officers in addition to their naval duties. There are some of them who are well informed and capable men. The nominal strength of the army is said to be 4,000; the actual strength depends entirely on the condition of the national treasury. In addition to this there is an organized national guard having a nominal strength of 25,000, but this is not in good discipline nor well armed.

URUGUAY.

Republica de la Banda Oriental del Uruguay, or the Banda Oriental, is an independent State of South America, situated between latitude 30° S. and 35° S., and longitude 53° W. and 58° 30' W. The area of the republic is estimated at 84,170 square miles by some authorities, and at 69,832 square miles by others. The population in 1873 was estimated at half a million; in 1829 it was 74,000; in 1836, 128,371; and in 1870, 387,421, according to the official census. Fifty-two per cent. of the inhabitants are foreigners. There is an increasing flow of immigration, numbering about 30,000 in 1873; but it is esti-

Area.

Population.

Immigration.

mated that at least one-half of these emigrate to the Argentine republic, Paraguay, and Brazil. The department of Montevideo contains about one-half of the entire population of the country. The mortality in this department, in 1870, was 3,059; in 1871, 4,380; in 1872, 3,642; sixty-seven per cent. being Uruguayans, the remaining thirty-three per cent. foreigners.

Mortality.

The government is based upon the constitution proclaimed in July, 1831, by the terms of which the executive power is vested in a president, elected for a term of four years, and a vice-president, whose term of office is the same, and who is also the presiding officer of the senate. The legislative power resides in a congress composed of a senate and house of representatives, whose sessions are annual, and extend from February 15 to June 30; the legislative as well as the general control of the administration being confided during the remainder of the year to a committee of two senators and five representatives. The country is divided into 13 departments: Montevideo, Guadalupe, San José, Florida, Colonia del Sacramento, Soriano, Paisandu, Salto, Tacuar-embo, Cerro Largo, Maldonado, Minas, and Durazno, the chief towns being Montevideo, the capital, Colonia del Sacramento, and Maldonado.

Government.

Departments

Towns.

The most important rivers are the Rio Negro, with its numerous tributaries, Arapey, Daiman, Yaguaron, and Sebollati. In the eastern part of the country there are two lakes, the largest of which lies partly in Brazil. In the neighborhood of these lakes a low sandy tract extends inland about 50 miles; but the greater part of the surface consists of an elevated table-land penetrated by many fertile valleys along the southern coast. The surface of the table-lands consists of extensive plains traversed by occasional ranges of low hills, the whole being almost destitute of trees.

Rivers.

Lakes.

Surface.

Potter's earth and umber are found, copper-ore is produced near cape Santa Maria, and mines of lead, gold, and silver are said to have been formerly worked. The climate is remarkably mild and healthy, but during the winter months a good deal of rain falls in the lower part of the country. Severe frosts occasionally occur on the table-land, but very little snow falls, and cattle are able to find subsistence at all seasons. A great deal of land is rich and fertile,

Natural productions.

Climate.

- Agriculture. but agriculture is much neglected. Wheat, maize, barley, rice, peas, beans, flax, hemp, and cotton, are all raised; and the vine, peach, sugar-cane, and a great variety of other fruit thrive remarkably well. Timber is also found on the banks of the principal rivers. The pastures are excellent, and the wealth of the inhabitants consists in their flocks and herds. Great numbers of horses and horned cattle run wild on the plains, and large flocks of sheep are kept, the wool of which is of a superior quality. Among the wild animals are included the tapir, deer, ounce, monkey, paca, rabbit, and fox. There are many varieties of birds; water-fowl frequent the lakes, and the country abounds in partridges and other game.
- Stock.
- Animals.
- Birds.
- Commerce. Uruguay carries on an extensive commerce with foreign countries, which is chiefly in the hands of foreigners. The rearing of cattle is almost the sole industry of the natives.
- Exports. The exports consist chiefly of salted hides, tallow, bones, wool, sheep-skins, and a considerable quantity of Liebig's extract of meat and jerked-beef, the total value of which in 1872 was \$15,490,000. The chief articles of importation are machinery and almost all kinds of manufactured articles and liquors. Smuggling is extensively practiced, and it is difficult, therefore, to give the value of the imports. In 1872 the official returns gave \$18,860,000, but at least one-third more should be added to arrive at a fair valuation of the whole amount of imports. The total customs receipts in 1870 were \$4,538,854; in 1871, \$5,312,318; and in 1872, \$7,207,907. Nearly one-half the exports are shipped to Great Britain; France comes next; the United States next; and Brazil, Spain, and Italy take the balance.
- Imports.
- Railways. The central Uruguayan railway is in operation for a distance of fifty miles, and is being rapidly pushed to the town of Durazno, a central spot in a productive district, and from whence the line will doubtless be pushed through the northern departments to the Brazilian frontiers. Another intended line of rail is being laid to connect Montevideo with the port of Salto on the Uruguay, and this port with Brazil, which promises to be a remunerative investment, and will therefore be pushed to completion. A third line is about to be commenced, and takes an eastern course from Montevideo toward the Brazilian frontier. These trunk lines together with

the branches which will necessarily follow, must result in a very important improvement in the character of the natives.

A submarine telegraph line has recently been laid from Montevideo to Buenos Ayres, another to Rio Grande do Sul, and two other lines overland to the Brazilian frontier. Montevideo is now in telegraphic communication with Europe and the United States. Telegraphs.

Several companies have been formed for the creation of artificial harbors in Montevideo bay and at other contiguous places. It is proposed by one company to build a dock, to have an area of 500 acres, in a bay not far from Montevideo, with which it would be connected by rail. Another company proposes to establish a graving-dock and submarine railway near to Piedras point; and numerous other schemes have been proposed by companies without capital, but there appear to have been no propositions from the capitalists. Artificial harbors.

There is, however, one scheme which is likely to be carried into effect—the privilege having been granted—which is, to provide fixed anchorages, to which all vessels entering the bay will have to moor, a corresponding tonnage-duty being imposed.

From an official publication in January, 1873, the public debt would appear to have been at that time \$41,481,235. Since the creation of the debt in 1859, the government has paid \$10,305,406 upon the capital, and \$12,153,955 of interest up to January, 1873. The estimated budget for 1873 was, revenue, \$6,796,000; expenditure, \$6,623,758. Public debt.

The territory included in the republic of Uruguay was originally settled by a colony from Buenos Ayres, but the possession of it afterward caused a war between Spain and Portugal, during which it was in turn several times occupied by both. The contest was finally decided in favor of Spain, and the country attached to the vice-royalty of Buenos Ayres, and known as the district of Banda Oriental. History.

When the war of independence began, the Banda Oriental sided with Buenos Ayres, but shortly afterward separated from that republic. The Brazilians, under the pretense of restoring tranquillity to the country, but really fearing that their revolutionary doctrines might spread into their own territory, took possession of it in 1821. Buenos Ayres protested against this proceeding, but war

did not actually break out until 1826. A treaty of peace was concluded in 1828, through the intervention of Great Britain, by which the northern part of the country, known as the Seven Missions, was ceded to Brazil, and the southern portion was declared an independent state, under the title *Republica Oriental del Uruguay*.

Internal dissensions soon broke out, and Rosas, the dictator of Buenos Ayres, was asked for assistance by one of the unsuccessful candidates for the presidency of Uruguay. A war ensued, and continued a long time with little advantage to either side, Brazil requesting the governments of England and France to interfere. These three powers sent ships of war and blockaded Montevideo in 1845. England maintained the blockade until 1848, France until 1849, when treaties were signed with Rosas. The war continued until 1851, when Oribe was defeated and Rosas deposed. Peace was now secured, and treaties entered into with foreign states; one concluded with Brazil and the Argentine Republic in January, 1859, secured the independence of the state.

In 1860, General Flores headed an insurrection against the government, and a civil war ensued, which lasted until 1864, when Brazil and Paraguay took part in it. The former sided with Flores; this brought a protest from Lopez, the dictator of Paraguay, who justly suspected the Brazilians of an attempt to annex the territory of Uruguay to Brazil. Lopez declared war against Brazil, and entered Brazilian territory with an army, which was but little opposed owing to the difficulty of collecting an army so far away from the capital. In the mean time a Brazilian army had captured Paisandu and sacked it. The combined forces of Flores and the Brazilians then marched against Montevideo. In February, 1865, a treaty of peace was signed, by which Flores was declared provisional president.

This led to the Paraguayan war, for on May 4, 1865, Flores entered into a treaty of alliance with the Argentine republic and Brazil against Paraguay, the allies "solemnly binding themselves not to lay down arms until the existing government of Paraguay should be overthrown." The Uruguayans practically withdrew from active participation in this war during the ensuing year, but their territory was

used as a base of supplies for the allied armies until the end of the war in 1870.

In February, 1868, a revolution broke out against the administration of Flores. It was headed by his sons, but with the assistance of the foreign vessels of war in the port it was temporarily suppressed, Flores having been made to resign. New disturbances broke out toward the end of the same month, during which Flores was assassinated. These disturbances were soon suppressed, and in March Battle was elected president.

In March, 1870, a formidable insurrection broke out in the interior of the country. This continued until April, 1872, when it was terminated by a treaty of peace. Thus it will be seen that the rival factions in the country are forever contending for office, not with arguments but with bullets. Their wars are a succession of skirmishes between small bodies of troops, and for barbarity are not excelled by the most uncivilized aborigines of the continent.

The city of Montevideo was founded in 1717; in 1800 it contained about 15,000 inhabitants; in 1860, about 37,000; in 1870, about 80,000, and at the present date the number of inhabitants are variously estimated from 80,000 to 130,000. It is probable that, at the lowest calculation, there are 110,000 inhabitants, forty per cent. of which are foreigners. Civil wars have hindered the growth of this city to an equality with Rio de Janeiro; for its position is such as to give it every advantage over Buenos Ayres as a receiving and distributing center.

Public improvements have recently been made to a very great extent; so that at the present time the city is supplied with water, gas, and a system of sewers. The streets are regularly laid out and very well paved. Many of the buildings are handsome; but there are none worthy of especial mention. Hotel accommodations are superior to any part of Brazil, and equaled in South America only by Buenos Ayres. There are several places of public amusement, including a fine opera-house, several theaters, and a bull-ring. An English Protestant Episcopal chapel, a Methodist mission chapel, and several Catholic churches make up the religious edifices. The stores are well supplied with everything necessary to the health and comfort of the most fastidious; and the

prices of dry goods, &c., compare favorably with the prices in New York.

The neighboring country is being rapidly built up with pretty villas, and in some of the gardens great taste is displayed in the arrangement of plants, &c. There is a small public library, several hospitals, schools, and one college worthy of the name. The educated and refined classes are very hospitable; and the females are proverbially pretty and entertaining while young. Paraguayan tea is indulged in to excess by all classes, ages, and sexes.

Shipping. The following exhibit of the shipping at the port of Montevideo is for 1872, and includes all but the small coasting-vessels and river-steamers :

Nation.	Ships entered.				Ships cleared.			
	Direct.	Indirect.	Total.	Tonnage.	Direct.	Indirect.	Total.	Tonnage.
Argentine	97	161	258	14,428	126	182	308	14,248
Brazilian	87	10	97	44,816	96	27	123	51,617
English	264	153	422	387,710	121	284	405	380,975
French	69	138	207	147,027	36	169	205	148,261
German	112	.....	112	43,371	109	.....	109	47,744
Italian	34	235	269	126,792	26	225	251	119,410
Norwegian	27	.....	27	10,586	26	.....	26	10,220
Portuguese	4	11	15	3,092	4	11	15	3,092
Spanish	115	142	257	61,204	92	171	263	59,779
Swedish	23	.....	23	7,854	28	.....	28	10,857
United States..	31	12	43	22,595	20	25	45	16,098
Total	863	867	1,730	867,475	684	1,094	1,778	882,301

This shows an increase in the tonnage over the preceding year of 178,158 tons.

Steamers. In 1860 one merchant-steamer per month was the only steam communication between Montevideo and Europe; in 1872 there were six English mail-steamers which arrived at and sailed from Montevideo for Europe in each month; there were also four French, one Italian, and one Spanish lines of steamers arriving and departing monthly, which were under contract to carry the mails. In addition to these there are a large number of freight-steamers, which take what are called ship-letter mails, thus increasing the mail communication with Brazil and Europe to an average of one per day at least. The steam communication with Bue-

nos Ayres, Rosario, Asuncion, and the Brazilian riverine ports is very frequent and regular, and is improving rapidly. The freights average about seventy-five per cent. to and from Europe above the cost of carriage in sailing-vessels. During the past four years English freight-steamers have sailed about twice a month from Montevideo for New York, via Rio de Janeiro and Bahia.

The duties on imports are: 1. Machinery, agricultural implements, instruments used in the arts and sciences, books, prints, maps, hides, hair, horns, tallow, bullion, and coin, are *free*. 2. Silk, laces, blonde, gold and silver embroidery, watches, jewelry, saltpeter, plaster of Paris, coal, timber, cotton fringe, and wooden hoops, *five* per cent. 3. Powder, pitch, tar, rosin, and naval stores, *thirteen* per cent. 4. All raw material and manufactured articles not included in the preceding enumeration, *fifteen* per cent. 5. Sugar, tea, cocoa, spices, drugs, and provisions in general, *twenty* per cent. 6. Furniture, pictures, looking-glasses, musical instruments, carriages, carts, &c, harness, saddles, horses' furniture, ready-made clothes, boots and shoes, liqueurs, spirituous liquors, wine, vinegar, cider, ale and porter, tobacco, and soap, *twenty-five* per cent.; salt, 2 reals per fanega. 7. Flour pays a variable duty, regulated according to the price of wheat, from 8 dollars to 3 dollars per barrel. Goods transshipped or shipped out of bond pay *two* per cent. Foreign goods shipped in vessels less than 150 tons burden, for ports on the Uruguay and Paraguay, pay *one* per cent. All dutiable imported goods pay *one* per cent. additional to the consulado; *one-half* per cent. to the hospital; and *one* per cent. additional on all goods paying *five* per cent.; *five* per cent on all goods paying *twenty-five* per cent.; *ten* per cent additional on flour; and *three* per cent. on wheat.

Ox and cow hides pay an export duty of "2 reals 25 ^{Duties on ex-ports.} centesimos for *reconnidor** valuations of one dollar," and *one* per cent. consulado. Horse-hides, one real for *reconnidor* valuations of five reals; and *one* per cent. consulado. All other produce of the country pays *four* per cent. on the market value, and *one* per cent. consulado. Jerked and

* The meaning of this word is not exactly understood; but it is doubtless *recognized* or *admitted* value.

salted beef, pork, &c., also all foreign goods that have paid the import due, *free*. Gold and silver, coined or in bullion, *one* per cent.

Port charges. National vessels from ports outside of the estuary pay 2 reals per ton, foreign vessels 3 reals, for port-dues; and both pay one dollar per day additional while loading and discharging. For *pratique* and a pilot national vessels pay 4 dollars, foreign 8 dollars; without a pilot, national 2 dollars, foreign 4 dollars. For the use of a boat 2 dollars. National and foreign vessels that do not discharge nor load, and that do not remain more than six days, are not charged tonnage-dues. Those remaining over six days without loading or discharging must pay one-third the above tonnage-dues. National vessels and vessels belonging to the Argentine republic employed in the river-trade pay a license for each voyage, which is graduated according to the tonnage, from 4 reals for vessels measuring from 3 to 7 tons, to 54 reals for those of 101 tons and over.

Hospital dues. National and foreign vessels bound to foreign ports pay 2 dollars for the vessel, 4 reals for the captain, 2 reals for each seaman, and 1 dollar for each passenger, hospital-dues.

Pilotage. The pilotage from Montevideo to Buenos Ayres, to be paid in Montevideo, is as follows: Not exceeding 9 feet draught, burgos measure, 50 dollars; 9 to 10 feet, 60 dollars; 10 to 11 feet, 70 dollars; 11 to 12 feet, 80 dollars; 12 to 13 feet, 100 dollars; 13 to 14 feet, 120 dollars; 14 to 15 feet, 140 dollars; 15 to 16 feet, 160 dollars; 16 to 17 feet, 190 dollars; 17 to 18 feet, 220 dollars.

Moneys. Moneys: 100 cents make a real; 800 cents or 8 reals make a dollar; 960 cents make a hard dollar, or patacon.

The current money is the Spanish dollar or patacon, equal to \$1.0341 American coin.

Weights and measures. The weights and measures are the same as those formerly in use in Spain, viz: Libra=7,100.21 grains troy=460.093 grammes. Pié=0.91407 foot=0.278635 meter. Vara=0.914117 yard=0.835905 meter. Fanega=1.57527 bushels=55.501 liters. Cantara=4.2618 gallons=66.133 liters. Cuartillo=0.13322 gallon=0.5043 liter.

Telegraphs. Montevideo has recently been connected by telegraph with the United States through Rio de Janeiro and Europe.

NORTH COAST—CONTINUED.

The coast between Lobos and Espinillo is formed by the southern slope of the cerro, which gradually declines to the westward toward the Santa Lucia river. The shore forms a series of small bays, separated by rocky points, and fronted by a bank of sand, with irregular depths. The limit of 3 fathoms is about one mile from the salient points. Yeguas point, $2\frac{3}{4}$ miles W. of Lobos, is formed by an islet connected to the mainland by a narrow strip of sand, which uncovers during low tides. The southern side of this islet is steep-to, with a depth of 19 feet within 1 cable, and 4 fathoms at one mile from the shore. A reef makes out to NE. from the eastern side; and the bay formed by this reef and the next point to the eastward is strewn with rocks. From Yeguas to Espinillo point the coast trends to NW. $\frac{1}{4}$ W. for $7\frac{1}{2}$ miles; the two most salient projections in this space are Pedregal and Castro points, both of which are foul and rocky.

Espinillo point is the eastern limit of the entrance to the Santa Lucia river; and the western termination of the elevation which culminates in the cerro of Montevideo. There are some remarkable white patches on the rise of the point. Its extremity is low, rocky, and fringed with a shoal which extends three-quarters of a mile from the SE. extremity of the point round to the westward and northward. The depth of water on this shoal varies between 6 and 10 feet; the edge is steep-to, with 17 to 20 feet about three-quarters of a mile from the shores. In the vicinity of the point there are several large, isolated boulders, some of which are covered, and have from 3 to $3\frac{1}{2}$ fathoms close to them. Vessels should not approach Espinillo point within the distance of a mile, as the currents are strong and uncertain near to it. The British gunboat Dart grazed a shoal of 12 feet depth, lying about $2\frac{1}{4}$ miles W. $\frac{1}{4}$ S. of Espinillo point.

The Panela rock lies S. 80° W. from the Cerro light-house, and S. 10° W. from the west extremity of Espinillo point. It consists of a cluster of sharp-pointed rocks, on which the depth varies between 8 and 15 feet at mean low water, except in one spot, where there is not over $3\frac{1}{2}$ feet. The whole cluster covers a space about 300 yards in extent, surrounded by a depth of 21 to 23 feet, muddy bottom, ex-

Espinillo point.

Shoal

Panela rock.

cept on the south side, where the bottom is rocky, without any change of depth, for 250 yards from the edge of the shoal.

Light-ship.

A light-ship is moored on the reef, under the following bearings: Cathedral tower N. 87° E., Cerro light-house N. 80° E., Espinillo point N. 9° E. The light is *fixed, bright*, elevated 18 feet above the sea, and visible in clear weather a distance of 5 miles. In 1872 there was a wreck of a paddle-wheel steamer on this reef, and the paddles could be distinctly seen a distance of 6 miles. A stranger, sighting the light-vessel for the first time, would probably mistake her for a steamer, unless the wreck has disappeared.

Directions.

The lead gives no warning of the approach to the Panela. A vessel in the vicinity of the reef, with the light-vessel not in sight, should keep the Cerro light-house bearing to the northward of E. by N. $\frac{1}{4}$ N., until the westernmost white patch on Espinillo point bears to the eastward of NNE. $\frac{1}{4}$ E. The cathedral of Montevideo, just hidden by Yeguas point, bearing E., leads through the channel between the Panela reef and Santa Lucia bank, with not less than 4 fathoms depth.

Shoals.

Vessels of deep draught should avoid the spots southward of the Panela, where the depth is only 18 feet, surrounded by 21 to 24 feet; one of these lies $3\frac{3}{4}$ miles S. $\frac{1}{4}$ W.; the other $5\frac{1}{4}$ miles SW. by S. of the light-ship; both are on the line of bearing S. 72° W. from the cathedral. The Cerro light-house, in line with Yeguas point, bearing N. 70° E., leads through the channel between these shoals and the Panela rock, in not less than 4 fathoms depth.

Santa Lucia river.

Tigre point lies 5 miles NW. by N. of Espinillo point; it is very little salient, and not easily distinguished. The coast, northeastward of the two points, forms a spacious, shallow bay, protected from all winds from NW. round by N. and E. to S. The outlet to the Santa Lucia river is in the head of this bay, through two branches, one on either side of a low, flat island, named Tigre, which is surrounded by a sand-beach extending nearly to the meridian of Espinillo point. The shores of the bay are also fronted by a bank of 8 to 10 feet; that on the eastern side is about 1 mile in width, that on the northern side about 2 miles; the former is flat; the latter shelves gradually to the shore.

The channels leading into the river are across the flat Channels. surrounding the island. The northern is the best and deepest; it ranges along the northern shore of the bay, and has a depth of not less than 6 feet during mean low water; the southern is obstructed by a rock in the entrance, and has only 4 feet over the bar. There are no marks or ranges for either channel; a stranger should therefore anchor, and send a boat to buoy the line of deepest water. The shoalest parts are of small extent, the depth increasing to 10, 12, 18, and 23 feet abreast of the island, and, in the river, to 8 fathoms; it remains between 5 and 8 fathoms as far as the confluence of the San José river, where it decreases rapidly, and continues to decrease as far as the village of Santa Lucia, situated 25 miles from the entrance. Vessels of 6 feet draught may ascend to Santa Lucia, if they can make headway against a current of 3 to 4 knots an hour, which is generally met with in the river. The rock in the entrance to the southern channel is just awash, and is marked by a buoy. The entrance to the river appears to be subject to frequent changes; extensive banks form outside, and are washed away before they are well known; large quantities of the river-banks are washed away, and obstructions formed in the entrance after every freshet.

The Santa Lucia is the boundary between the departments of Montevideo and San José. Santa Lucia village has a population of about 800 persons. The town of San José, capital of the province of this name, stands in a valley near the right bank of the river, about 25 miles inland; the population is estimated at 5,000.

The northern shore of Santa Lucia bay is a line of cliffs, Cliffs. from 60 to 80 feet in height, which terminates 2 miles westward of Tigre point. A low strip of sand separates these from another line of cliffs, which are from 70 to 100 feet in height and 6 miles in length. A break in the coast at this point is the bed of the San Gregorio river. To the westward, the cliffs again appear of the same general elevation, extending a distance of $5\frac{1}{2}$ miles, where they become broken as far as Santa Maria or San Gregorio point, situated $17\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. of Tigre point.

These cliffs, beginning from the mouth of the Santa Lucia river, are named Barrancas of Santa Lucia, Mauricio, and

Gregorio; the entire coast between the river and San Gregorio point being known as the Rincon de Alcibas.

San Gregorio
point.

San Gregorio point is not very salient, but well marked by steep cliffs, 100 feet in height, of darker color than those which precede them, and by two or three houses on its summit. The space between the termination of the Barrancas de San Gregorio and the point is much lower than either, and has two breaks in it.

Banks.

Santa Lucia bank fronts the Barrancas of Mauricio and Santa Lucia. The southern extremity lies 5 miles WSW. of Espinillo point, and $5\frac{1}{2}$ miles NW. by W. $\frac{3}{4}$ W. from the Panela light-ship. The southern edge is very irregular; the western edge trends irregularly to NW., toward the mouth of the San Gregorio river. The depth on the bank varies between 12 and 17 feet, except in one small space, where there are 6 and 8 feet only; this lies 7 miles W. by N. of Espinillo point. The depth of water close to the edges is $3\frac{1}{2}$ to 4 fathoms, bottom of mud; this changes gradually to 15 or 17 feet, sandy bottom, on the bank. The Barrancas de San Gregorio are supposed to be fronted by a bank, but nothing is known of its extent, depth, or limits. The depth of water 2 miles from the land is known to be 20 to 23 feet, except in one place, where there is a shoal of 12 feet. This lies $3\frac{1}{2}$ miles from the coast, about 7 miles SE. $\frac{1}{4}$ E. of San Gregorio point, and 25 miles W. by N. $\frac{1}{2}$ N. from the Cerro light-house. The pilots assert that this bank has been swept away by the currents. It is probably identical with the one on which the Dart struck.

Jesus Maria, or
Sandy point

Jesus Maria point lies 4 miles NW. by W. $\frac{1}{2}$ W. of Santa Maria; the intervening shore is composed of sand-hills about 30 feet in height, fronted by a wide beach. Fish abound in the bay, and the beach is well adapted to seining; an abundance of deer, partridge, and duck are found in the neighboring country.

Bank.

Sandy point makes out three-quarters of a mile to SW. from Jesus Maria; it is a low, flat, sand-spit, covered during high stages of the estuary. The bank fronting the shore in this vicinity makes out 2 miles to SW. from Jesus Maria point; it then turns abruptly to ESE., tapering gradually to the extremity, which lies 2 miles SW. of Santa Maria. The depth of water on the latter part is 10 to 17 feet; the edges are very steep, $4\frac{1}{2}$ to 5 fathoms being found close to depths of 10 to 14 feet; the bottom changes abruptly

from soft mud alongside of, to fine sand on the bank. The depth of water in the space between the edge of the bank fringing the coast and the northern edge of this spit is between 19 and 23 feet.

Pavon point lies $11\frac{1}{2}$ miles NW. $\frac{1}{4}$ W. of Jesus Maria. Pavon point.
The intervening coast is a line of sand-downs, from 80 to 30 feet in height, with irregular intervals of low beach between them. One of these downs is conspicuous on account of the sea-face rising abruptly from the low shore. This stretch of coast offers few remarkable features, except some groups of trees which are visible from the offing, one near the outlet of the Pavon river, the other about midway between this and Sandy point.

The entrance to the San Miguel river, about 2 miles north- San Miguel
river.
westward of Sandy point, is conspicuous at a distance of 6 to 8 miles. It has the appearance of a large tree, the dark brush-wood at the entrance being strongly contrasted with the continuous sand-hills stretching to the northwest from Sandy point. Pavon point is low and wooded.

A short distance northward of Pavon point is the limit of Ensenada de
Pavon.
3 fathoms navigation along the northern coast of the estuary. The spit of the Ortiz bank here leaves the shore, trending to SSE. and forming a *cul-de-sac*, named Ensenada de Pavon, where there is a rather exposed anchorage in $3\frac{1}{2}$ fathoms, muddy bottom. There is, however, an inshore channel between the northern edge of the Ortiz bank and the coast, suitable for vessels of 14 feet draught and less, although the pilots are unwilling to take vessels drawing more than 12 feet through it.

Rossario point lies 14 miles WNW. of Pavon point. It Rossario point.
is very little salient, but the shore is steep and the sand-downs are higher near to the point than they are on each side of it. The coast between Pavon and Rossario points forms a bend. About $1\frac{1}{4}$ miles N. by W. of the former is Pavon and Pe-
reyra rivers.
the outlet of the Pavon and Pereyra rivers; and 6 miles westward of this is the mouth of the Cufre. Cufre river.
Here the trend of the coast changes from a general NW. to a W. direction, and so continues to Colonio. The sand-hills become more elevated, rising to the height of 140 feet; one of them has the form of table-land, and marks the mouth of the Cufre river, which flows along its eastern and southern base. A few small rocks lie off the mouth of the Cufre.

Rincon del Cufre.

This part of the coast is known as the Rincon del Cufre. The shores of the bend are low; the first 3 miles westward of Pavon point they are wooded; this is followed by a flat barren space of 1 mile, at the end of which the downs commence. On the western side of the Cufre there is another wooded space of 1 mile or more, westward of which the downs are bare, and rise gradually toward the mouth of the Rosario. All along this bend there is 14 to 16 feet within 1 mile of the beach, and, as a rule, the depth decreases gradually from thence in-shore.

Rosario river.

The Rosario river empties into the estuary $1\frac{1}{2}$ miles westward of Rosario point; the eastern side of the entrance is a narrow point, terminated by a cluster of rocks; the bar is shallow, but inside there is a depth of 8 feet for a distance of 12 to 15 miles up the river.

Sauce point.

Sauce point, 5 miles W. of Rosario, is salient, wooded, and fronted by a ledge of rocks awash; it is marked by two conspicuous houses 1 mile from the shore, and an isolated mound, 105 feet in height, situated about $1\frac{1}{2}$ miles N. by W. of the point. The intervening shore is a low sand-beach, backed by a line of low sand-downs of uniform height and appearance.

Artilleria point.

Artilleria point, 5 miles farther west, is fronted by a ledge of rocks, which extend half a mile to the southward, where the depth is 14 feet. The point is salient, and 50 feet in height; the land rises gradually to the northward and westward, forming a line of hills about 150 feet in height. The coast fronting these hills forms a bay which terminates $6\frac{1}{4}$ miles to the westward, where there is a ledge of rocks fronting the shore. This bay is foul, the soundings showing a rocky and uneven bottom from the depth of 15 feet.

Pipas rocks.

The Pipas rocks, situated $8\frac{1}{2}$ miles E. of Colonia light-house and $1\frac{1}{2}$ miles from the shore, are uncovered except when the waters of the estuary are unusually high; they have the appearance of casks floating on the water, from which they derive the name. The cluster occupies a space about half a mile in extent. The depth of water between the rocks varies from 8 to 12 feet; on the E. and W. sides the bank is shelving, but steep-to on the N. and S. sides. There is another reef situated $1\frac{1}{2}$ miles NE. of the Pipas, and 1 mile from the shore.

A dangerous rock lies $7\frac{1}{4}$ miles S. 83° E. of the Colonia light-house, and $1\frac{1}{2}$ miles SW. by W. $\frac{3}{4}$ W. of the largest of the

Pipas; it is only 7 feet below the surface, steep-to, with 15 feet round it, and 17 feet in the channel which separates it from the Pipas. To pass southward of both keep Colonia light-house bearing to the northward of W. by N. until Angostura point bears N. Colonia light-house bearing W. $\frac{1}{4}$ N. leads between the Pipas and the rock to the southward. To pass between the Pipas and the rocks to the northward keep the light-house bearing W. $\frac{1}{4}$ S. It would be prudent to pass to the southward of all these rocks.

The first salient projection westward of the Pipas is Angostura point; ^{Angostura point.} it is low, fringed with rocks, and forms the eastern limit of a small bay, into the head of which flows the Chnelo river. A short distance westward of the river, the downs rise to an elevation of 130 feet, and on the summit of the highest there is a farm-house. Between the base of these downs and the shore the land is low and intersected with several lagoons, which abound in water-fowl. The depth of the channel increases abreast of these to 3 and 4 fathoms, which is maintained until you reach Colonia.

The town of Colonia del Sacramento is built on a slightly elevated point extending 6 cables to the westward. ^{Colonia del Sacramento.} The NW. extremity of the point is named San Rita, and the SW. San Pedro. The town has a very dilapidated appearance, but there is a considerable trade in hides and wool carried on in it. The department of which it is the capital is admirably adapted to the raising of stock, particularly sheep; and recently an impetus has been given to this branch of industry by the purchase of extensive tracts of land by English and Buenos Ayrean capitalists, with a view to raising a better class of sheep than have been raised heretofore. The department has an estimated area of 2,000 square miles; a population of 11,000, about 3,000 of whom are foreigners; and in 1870 the estimated number of animals was 850,000. The capital has a population of about 1,200 persons, during the brief periods of peace in the country; and is generally deserted during the wars.

The town was founded by the Portuguese in 1678; the Spaniards took possession of it in 1680, and since this date it has changed nationality about fifteen times. Rosas, the dictator of Buenos Ayres, took possession of it in 1845, but it was wrested from him by the French and English fleets, and restored to the Uruguayans. The civil wars in

this unhappy country seem to have been felt at Colonia more than any other place. Its position is an excellent one for the establishment of a great distributing center for the valley of the Plata; but so long as the inhabitants of the country persist in resorting to arms to settle trifling disputes about office there can be no improvement.

The cathedral is the most conspicuous building, and is the first object seen when approaching the town. A marine railway has been built on the northern side of the peninsula, capable of lifting a dead weight of 500 tons, and of taking on a vessel drawing 9 feet, when the estuary is lowest. There is great difficulty in placing a vessel on the cradle, as the current runs strongly at right angles to the line of the ways. The following information was obtained from the superintendent in 1871:

“Sailing-vessels over 100 tons, American or English measurements, will be charged \$1 per ton for being taken out of water. Each nominal horse-power of engine, in steamers, will be charged as an additional ton of measurement. Sailing-vessels and steamers under 100 tons will be charged the rate for 100 tons. Cargo will be charged \$1.50 per ton for being lifted, and the regular rate for lying on the dock. The charge for lying on the railway commences from the hour the vessel is out of water, and is at the rate of seventy-five cents per ton for 24 hours; and any 24 hours entered upon will be charged as a full day. Vessels that have been wrecked or hogged will be charged special rates, to be agreed upon by the agents of the dock and the vessel. No charges will be made for Sundays and stormy days when no work can be done below the load-lines. *All charges are in gold.*”

Wharf.

Supplies.

A wooden pier on the northern side of the peninsula extends out to a depth of 12 or 13 feet at ordinary stages of the estuary. Fresh beef, mutton, chickens, and vegetables may be obtained at moderate prices. Water is taken from alongside. Sea-stores are scarce and expensive. Coal in small quantities may be bought at all times. Wood is rarely if ever to be had. The neighboring country abounds in game.

Light-house,
latitude 34° 28'
10'' S.; longitude
57° 49' 42'' W.

The light-house of Colonia is near the SW. angle of the plaza; it is dull brick-color, and not very conspicuous during the day. It exhibits at an elevation of 110 feet above the

mean level of the water, a *revolving, bright light*, which attains its greatest brilliancy every *three minutes*, and is visible at a distance of 10 to 15 miles, according to the state of the horizon.

Vessels drawing 18 feet and less may find a secure anchorage inside of the reefs, but the entrance is difficult, and the services of a pilot are necessary. The usual anchorage is half a mile WNW. of San Rita point, in 4 to 5 fathoms, muddy bottom. Vessels should moor with an open hawse to SW., and a short scope on each anchor, so as to ride to both anchors after veering chain. This anchorage is sheltered from N. round by E. to SE.; but only partially protected from SW. by the islet San Gabriel and Laja bank. Fisher's bank breaks the sea from the southward.

Colonia roads.

Commencing from the S. and W., the first danger comprised in the limits of Colonia roads lies $4\frac{2}{3}$ miles W. $\frac{3}{4}$ S. from the light-house, and 4 miles SSW. of the westernmost of the Hornos islands; the depth on this is from 5 to 15 feet, over a space about 1 cable in diameter; the bottom is rocky on the reef, which is surrounded by 21 and 22 feet of water, over a soft mud bottom. To avoid this danger keep the light-house in line with Farallon island until nearly up to the latter.

Islands and reefs.

Fisher's bank is an extensive plateau of hard sand, over which the chart shows a depth of 14 to 18 feet, except in three places, where there is 12 feet and less; the shoalest spot is about 2 cables in extent, and lies 1 mile and 4 cables SW. by W. $\frac{1}{2}$ W. from the light-house and SE. from the center of San Gabriel island. The pilots of the Plata assert that the sand is rapidly accumulating on this bank, and that the depth of water on it is less than is shown on the charts. During fresh southerly gales the sea has been seen to break on the shoalest parts.

Fisher's bank.

The Farallon is a rocky islet, 35 to 40 feet in height, surrounded by a reef, the whole covering a space half a mile long WNW. and ESE., by three cables wide, in the western part; and from thence tapering toward the eastern end in the shape of a quoin. One part of the reef to the northward is detached with 12 to 13 feet water between it and the islet. The center of the islet lies $3\frac{1}{2}$ miles W. by S. from the light, and $3\frac{3}{4}$ miles S. of the westernmost of the Hornos islands. There are three detached patches of rock

Farallon islet and reef.

which properly belong to this group; they lie respectively 7 cables N. by W., $4\frac{1}{2}$ cables N. $\frac{1}{2}$ W., and $6\frac{1}{2}$ cables N. $\frac{3}{4}$ E. from the center of the island; the depth on these varies between 6 and 10 feet. The northernmost is the largest; it covers a space 1 cable long ENE. and WSW., by one-quarter of a cable wide, and lies with the center of San Gabriel island in line with Colonia light-house bearing E. Between this shoal and the west end of San Gabriel island, within a radius of half a mile from the former, there are other rocky heads, one of which has only 13 feet at low-water. Farther east toward the island the depth increases to 7 fathoms in places, and commonly to 6 fathoms.

Beaumanoir
rock.

In 1856, the brig Beaumanoir, while beating from Colonia to the anchorage northward of the Hornos islands, touched on a rock which now bears her name. The position of this rock is 4 miles W. by N. $\frac{1}{4}$ N. from Colonia light-house, and 2 miles 3 cables S. $\frac{1}{2}$ W. from the W. end of the westernmost of the Hornos islands; the depth of water on the rock is 12 feet; its extent about 2 cables.

San Gabriel
island.

San Gabriel island, situated 2 miles W. of the light-house, is low and sparsely wooded; a hut stands on the northern part of a slight elevation in the center. A reef and bank surround this island, the whole covering a rectangular space nearly 1 mile in length and half a mile in width. The most dangerous part of the reef lies $1\frac{1}{2}$ cables W. of the SW. point of the island; portions of it uncover at low water.

Laja bank.

The space between San Gabriel island and Colonia point is partially occupied by a bank and reef of rocks, 6 cables long and 2 cables wide, portions of which uncover during low tides; this is known as Laja bank. Between the eastern end and the edge of the bank which fronts the shore of Colonia, the channel is 6 cables in width, and from 19 to 38 feet in depth, except in one small space where there is only 16 feet of water, over a rocky bottom. Fronting the shore and detached from it by a narrow passage of 15 to 18 feet depth, there is another rocky bank with less than 12 feet at low water. The southern end of this bank lies W. by N. $\frac{1}{4}$ N. of the light-house, and $1\frac{1}{2}$ cables from the shore; the northern end lies NW. $\frac{1}{4}$ W. of the light-house, and 1 cable from San Rita point.

Lopez islets.

Lopez islets lie E. and W. about 2 miles NW. of Col-

onia. They are barren rocks, 8 to 12 feet in height, separated into two groups, each in the midst of a long, sandy flat or spit extending to the northward beyond the Hornos islands. There is a channel between the groups and spits about two cables in width, with a depth of not less than 17 feet. Northward of the eastern group of islets there is a deep bight, which extends eastward half a mile into the sand-bank bordering the coast, having in it a depth of 20 to 24 feet. This is named Lopez road. Several vessels have been hove down here for repairs, the anchorage being considered the best sheltered spot in the estuary. Lopez road.

There is a rocky patch, half a cable in extent, over which there is a depth of 5 feet, situated $3\frac{1}{5}$ miles N. 65° W. of Colonia light-house and 4 cables westward of the western group of the Lopez islets. Half a mile NNW. $\frac{1}{2}$ W. of this there is another rocky patch 1 cable in extent, with a depth of 9 feet over it. These are surrounded by 14 to 18 feet, muddy bottom, and are doubtless a part of the Lopez rocks. Relampago
rock.

The Hornos, situated 2 miles northward of the Lopez islets, are a group of three low, small islets lying in an E. and W. direction, with a channel of 16 to 30 feet depth between the two eastern. The center and western islets are surrounded by a bank extending 6 cables W. by S. from the latter; the depths over it are from 10 to 16 feet, bottom of rock and clay. Near the western extremity of the bank, about half a cable distant, there is a rock, having a depth of only 12 feet over it, on which the Italian corvette Etna struck in 1871. Colonia cathedral, open to the southward of the western Lopez islet, clears this rock. The best anchorage is 3 cables NNW. of the westernmost of the Hornos islets, in 18 feet, muddy bottom. There are two huts on the eastern islet. Hornos islands.

Etna rock.

In steering for Colonia from the southward the first island that comes in sight is Farallon, which has a rounded top, and is visible fully 2 miles farther than San Gabriel, which is low and wooded. Bring the west end of San Gabriel to bear N. and steer for it on this bearing until a conspicuous house, having one story and five windows, situated on the beach, comes between the cathedral and a windmill to the southward of it, exactly filling the space between. This mark leads between the NW. end of Fisher's bank and San Gabriel, in 18 feet during low water. Immediately as the Directions.

eastern islet of the Lopez group comes open of the eastern end of San Gabriel, bring the cathedral and *mark-house* in line, or the cathedral its own breadth open to the southward of the house, which will lead clear of the southeastern edge of Laja bank. When the central and smallest of the Hornos islets is a little open or just touching the western end of the eastern Lopez islet, change the course to the northward, and steer for the latter, which will lead into the road. Anchor when Farallon island comes in line with the southern edge of San Gabriel island, in $4\frac{1}{2}$ fathoms, stiff mud bottom.

Coast.

The northern shore of the estuary from Manuel point now assumes a northwesterly direction for 22 miles as far as Martin Chico point. It is chiefly composed of low cliffs, interspersed with sand-beaches and backed by a line of hillocks varying from 70 to 160 feet in height. The most conspicuous landmarks are: The *ombu* tree of San Pedro and the mouth of the river of the same name north of it; the latter may be readily known by the break in the hills, those to the southward being the highest; the *ombu* tree and river of San Juan; a clump of dark bushes, situated close to the shore, near to two small dark cliffs, 2 miles southward of Pareda point; and 6 miles inland, the cerros San Juan, which serve as a landmark all over the upper part of the estuary.

Landmarks.

San Juan river.

The San Juan river has a wide shallow entrance, with two channels, one of 2 feet, the other $2\frac{1}{2}$ feet depth across the bar at low water. The depth increases to 16 and 18 feet inside the river, and continues so for several miles.

Cerros San Juan.

The cerros San Juan, three summits of the same hill, are the highest land near the northern shore of the Plata. The northern summit is 445 feet in height, the middle one 350 feet, and the southern 370 feet. In clear weather they have often been seen from Buenos Ayres, a distance of 33 miles; but when the atmosphere is sufficiently clear for this it is an unmistakable sign of approaching bad weather.

Martin Garcia island.

Martin Garcia island, situated $25\frac{1}{2}$ miles N. 49° W. of Colonia, and in the head of the estuary, is a mass of granite, about two miles in circumference around the base, rising in the form of a flattened cone, to an elevation of from 160 to 190 feet. The shores are rocky, with the exception of a small strip of sand on the northern side, where there is a

landing place. The position of Martin Garcia island, between the two narrow channels leading to the rivers Parana and Uruguay, renders it a strategic point of great importance. In order to enter either of these rivers, a vessel must pass within half a mile of the islet, on the southern side, or within less than a mile on the eastern. There is a battery on the southern side, occupied by a small garrison from Buenos Ayres. There are also several huts on the island, occupied by quarrymen engaged in procuring stone for building-purposes. A flag-staff, a few trees, and several clumps of bushes are seen on the heights.

Two beacons have been placed on Martin Garcia for the purpose of guiding vessels through the channel; one is a mast, situated near the center of the island; the other a white beacon near to the southeastern end. There is also a *fixed bright* light, exhibited from the mast, between sunset and sunrise, which is visible about ten miles in clear weather.

There are two channels through which vessels may enter the rivers above Martin Garcia; the one to the southwest of the island is named Martin Garcia channel; the other, on the northeast side, is named Canal del Infierno, on account of the currents and banks which impede its navigation.

The Martin Garcia channel is about 17 miles in length, half a mile in width, and is navigable for vessels of 14 feet draught. It is formed on the west side by the extensive flat which occupies the greater part of the head of the estuary, named Playa Honda, or Palmas flat; and on the east by the Santa Anna and some detached banks, which extend to the southeastward from Martin Garcia island. It will be difficult to navigate through this channel without a beacon always in sight, not only to point out the route, but also to show the set of the current, which is always uncertain.

The following buoys and beacons have been placed in this channel: The fair-way buoy, *red*, moored in $16\frac{1}{2}$ feet, lies $10\frac{1}{4}$ miles SE. $\frac{1}{2}$ E. from the white beacon on Martin Garcia island. From the position of this buoy a remarkable clump of dark bushes, on the northern shore of the estuary, is seen a little open to the southward of the highest summit of the cerros of San Juan, bearing NE.

Santa Anna bank is marked by two *red* bnoys, one on the southeast end, which bears NW. $\frac{1}{2}$ N., distant $2\frac{1}{3}$ miles from the fair-way buoy; the other, near the middle of the bank, situ-

ated 2 miles NW. by N. of the preceding. A beacon is situated $1\frac{1}{4}$ miles NW. $\frac{3}{4}$ N. from the last-mentioned buoy, and another beacon lies near the northwest edge of the bank.

The south side of the channel is marked by a beacon situated $1\frac{3}{4}$ miles NW. by W. from the southeast buoy on Santa Anna bank, and also by a large barrel-buoy, surmounted by a flag, which lies NW. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from the beacon last mentioned.

The middle bank is marked by two *red* buoys, one over the southeast end situated $3\frac{3}{4}$ miles SE. from the white beacon on Martin Garcia island, and one on the western side of the bank, near the center, three-quarters of a mile from the southeast buoy. The middle bank is also marked by two beacons, one near the center, on the eastern side, and one on the northwest end. The bank extending to the westward of Martin Garcia, is marked by a post, near its western edge, and by a square *black* buoy near its northeast end.

These beacons and buoys are moved as the alterations in the channel require; the positions given above are approximate, and taken from a notice issued in 1870.

Canal del Infierno.

The Canal del Infierno, which passes northeast of Martin Garcia island, has quite as much water as the other, but is not buoyed, and is very little used, except by the river-craft.

It seems needless to state that neither of these channels should be attempted in foggy weather or at night, and that the services of a pilot are indispensable.

Here, as elsewhere in the Plata, the height of the water depends on the force, direction, and duration of the wind. There is a rise of 5 and 6 feet with fresh southeasterly and southerly winds, and of fall with those from the opposite quarter.

The uncertain depth of the channel is the cause of much loss of time to vessels lading above, and bound into the rivers. There is no means of predicting the probable depth, and it would be an excellent plan to have a small steamer stationed at Martin Garcia for the purpose of sounding the channels daily, and signaling the depth to vessels above and below.

SOUTHERN COAST OF THE ESTUARY.

The southern coast of the estuary is low, uniform, and uncultivated; it is the termination of the *pampas* of Buenos

Ayres, which extend 420 miles to the westward as far as the Cordilleras. On these vast plains there is no vegetation, save an occasional *ombu* tree, nor any water, except such as is found in the marshes after heavy rains. The only inhabitants are Indians or "half-breeds," whose chief occupation is thieving from the farms on the frontiers of the province of Buenos Ayres. The navigation along the coast is rendered difficult from the absence of marks, by which the position may be established; there are a few clumps of trees along the shore, but these being low are visible only a short distance from the offing.

Cape San Antonio is the name given to a line of coast which extends 41 miles N. and S., and terminates in two low points, the northern named Rasa, the southern Medano. The shore is a low sand-beach backed with barren hillocks, interspersed with clumps of stunted bushes, which commence near Rasa and, gradually rising, reach an elevation of 60 to 80 feet, near to Medano point. These hillocks are visible 8 to 10 miles in clear weather; two of them, near together in latitude $36^{\circ} 37'$ S., are a little higher than the others, and have the appearance of a Spanish saddle. There are two others, one in $36^{\circ} 28'$ S., the other in $36^{\circ} 46'$ S., named Medano Chato and Medano Alto, which were used as observing-stations when this coast was surveyed; but the mariner must not depend upon recognizing either, for the wind frequently changes the height and the appearance of their summits.

Rasa point is a low spit of sand extending 1 mile northward of cape San Antonio, and prolonged under water $1\frac{1}{2}$ miles farther where there is a depth of about 10 feet. Three miles N. of the extremity of the spit is the NE. end of a shoal forming the crown of Tuyu bank, which extends 6 miles NW. and SE. with a breadth of 2 to 3 miles. The general depth over the bank is 10 feet, but on the shoalest part, named Cabo shoal, there is less than 6 feet. The sea nearly always breaks on Rasa spit and Cabo shoal; and when strong easterly winds are blowing there appears to be a line of breakers extending clear across the interval between them, where there is a depth of only 10 to 15 feet at low tides.

The depth of water 1 mile from the shore between Medano and Rasa points is from 10 to 13 feet; 5 miles E. by S. from

the latter it is 23 feet, bottom of sand and mud; at a distance of 9 miles to the eastward there is a depth of 7 fathoms, bottom the same; and at 12 miles ESE., the depth is $8\frac{1}{2}$ fathoms, the bottom fine sand and broken shells. The average depth 10 miles from this coast is 8 to 9 fathoms, with a gradual decrease as the shore is approached, but this depth remains unchanged for a considerable distance off shore; at 30 miles there is about 11 fathoms, 40 miles 12 to 14 fathoms, with occasional shoaler spots, and from thence it changes more rapidly to 30 fathoms 60 miles from the land.

Admiral Fitz Roy demonstrated that the nature of the bottom in the vicinity of Rasa point is subject to frequent changes, while the depth of water remains the same; this he explains by the supposition that the soft mud of Tuyu bank is sometimes swept seaward by the currents and deposited over the sandy bottom; but it is again stirred up and driven into the estuary by gales from the southward. There is no doubt that a continuation of fine weather in the estuary allows the muddy water to deposit a sediment, and on the banks there is a sensible difference in the nature of the bottom after continuous fine weather, and after heavy gales. It is probable that the same thing occurs within certain limits outside.

Tides and currents.

The tides are very much influenced by the wind; the water rises with SE. and falls with NW. winds in the vicinity of cape San Antonio. The general direction of the current is to NNW. or SSE., and the rate varies from 1 to 3 knots an hour. The tides are comparatively regular in fine weather. It is high water, full and change, at 10^h; the rise and fall is about $6\frac{1}{2}$ feet. Strong southerly winds produce a rise of 12 feet, and sometimes more.

San Borombon bay.

Piedras point lies 55 miles N. by W. $\frac{1}{2}$ W. from Rasa; the intervening coast curves to the westward and forms San Borombon bay. The shores of the bay form the arc of a circle having a radius of 21 miles; they are very low, and, but for a few scattered clumps of trees, they would be difficult to distinguish from the sea horizon. The limit of 6 feet depth lies between 1 and 2 miles from the shore; that of 18 feet is more regular, and averages 6 miles from the land; inside of this limit the bottom is generally of soft mud, into which the lead sinks 2 feet and more. During fresh winds from the offing the shores of this bay present a line of con-

tinuous breakers. A vessel caught within its limits would find it difficult to work out under sail.

Several narrow openings in the beach indicate the outlets to the marshy rivers of brackish water flowing from the interior plain; the mouths of these are all obstructed with banks. The most conspicuous objects on the shores of the bay are the occasional clumps of trees named *islas*. The first remarkable group, named Juncal, is very near the beach on the parallel of $36^{\circ} 01' S.$; the next is the Rodeo, 7 miles to the northward; near to the latter the shore is backed with a line of low sand-hills about 20 feet in height, which extend to Piedras point. One of these, marked on the charts mount Rosas, is crowned with trees, and has an elevation of 30 feet; the ruins of a village stand on the summit. Close to the shore, 1 mile northward, there is an old brick-kiln about 20 feet in height above the sea.

Landmarks.

Juncal.

Rodeo.

Mount Rosas.

The entrance to the Salado river is $2\frac{1}{2}$ miles northward of the brick-kiln; the bar is impassable, except when the waters of the bay have been raised to an unusual height by the wind, when there is a depth of 6 to 8 feet in the channel; at other times the smallest boat cannot even effect a landing, for the mud is too soft to bear the weight of a man.

Salado river.

It is high water, full and change, in this locality about $10^h 45^m$; the tides rise 6 to 8 feet. The land between the mouths of the Salado and San Borombon rivers is about 20 feet in height, and visible 4 miles; at this distance the depth is about 12 feet; 2 miles farther off shore it is 18 feet. The San Borombon river is dry at low water. The most remarkable object between this river and Piedras point is a large clump of trees on the summit of one of the downs, marked on the chart Juan Jerónimo, situated on the parallel of $35^{\circ} 34' S.$

Tides.

San Borombon river.

Mount Juan Jerónimo.

Piedras point is low, and composed of a friable sandstone named *tosca* by the natives and pilots. It is fronted by a reef of the same material, which extends $3\frac{1}{2}$ miles to the southward along the coast, and $1\frac{1}{2}$ miles to the eastward. The bank bordering the southern coast of the estuary between Piedras point and Buenos Ayres is largely composed of the same material; it extends 6 to 8 miles from the shore. The land is low, and cannot be seen beyond this distance.

Piedras point.

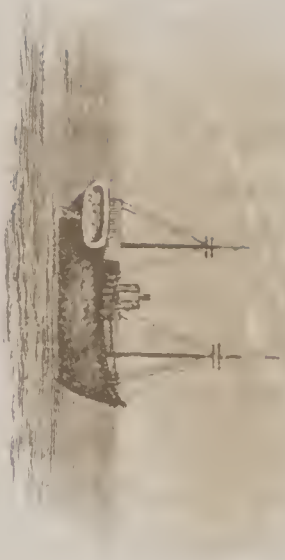
Piedras bank. Piedras bank is a continuation of the shoal which fronts the coast of San Borombon bay. Abreast of the point the breadth increases and the bottom becomes hard. The depth of water 15 miles SSE. of the point is 12 to 15 feet; the edge of the bank then trends to N. by W. for 30 miles, where it turns to the westward and gradually approaches the coast. The bottom becomes softer abreast of Atalaya point. Six miles E. of Piedras the depth is 18 feet; thence eastward the increase is gradual, but the bottom changes to soft mud and ooze.

The northern and eastern approaches to dangerous depths are generally indicated by a change in the nature of the bottom from soft mud to *tosca* mixed with gravel, and a very gradual decrease in the soundings, but the southern edges are generally steep-to, and the bottom remains soft until the edge of the bank is reached.

Cerro Salvador Grande. The cerro Salvador Grande and *islas* Observation and Espinillas may be seen, during clear weather, from the eastern edge of Piedras bank. The first is a very slight elevation, crowned with trees; the second is marked by an isolated tree on the summit; and the *isla* Espinillas is nearest to Piedras point. Errors in estimating the distance from the land are often produced by refraction, and should be guarded against.

Indio point. Indio point lies 15 miles NW. of Piedras. The intervening coast is low, and can hardly be seen from the edge of the bank fronting it. Memoria point is a slight projection nearly abreast of the so-called cerro Salvador Grande, situated about 8 miles to the southward of Indio point. This hillock is often mistaken for that on Indio point; they may, however, be distinguished by the following marks: Indio point hill is covered with tufts of bushes, has a whitish base, and an elevation of 40 feet; the cerro Salvador Grande is not very distinct; it shows a smooth surface, and there are no houses near to it, while near to Indio point there are some white houses showing distinctly to the southward.

Remarks. The hill near Indio point is visible about 10 or 12 miles when the horizon is clear; at this distance it appears like an island, but, as you approach nearer, the neighboring country comes in view; this is generally seen from a distance of 6 miles. In the immediate vicinity of the point the country is a flat grassy plain. A small stream flows into the estuary



Chien Light Vessel
(painted Red)

The Light Vessels often drift
in gales, their positions cannot
therefore be reliably relied on



Indio Light Vessel
(painted Red)



Magdalena from the Northward
(visible in clear weather 14 miles)



White E, R. Ford Hill,
Indio Point, S W 5 miles

close to the point; it may entered by boats except when the water is very low. The crew of the light-vessel frequently land here for supplies, which are procured from the neighboring farm-houses. Having passed the point a continuous line of brush-wood of uniform height will be observed until Magdalena village is approached, when the *ombu* trees on the slight elevation near to it are more readily distinguished.

It is high water, full and change, at Indio point at 11^h 45^m; the rise averages 4 feet. The tides are only noticeable during a continuation of fine weather and moderate changeable breezes. Tides.

Indio point light-ship is moored in 3½ fathoms 11 miles NE. ¼ N. from the tufted hillock near Indio point, and one-quarter of a mile from the southeast end of Cuirassier bank. The vessel is painted red; she has two masts, and about midway between them a signal stand, which from a distance resembles a steamer's funnel. A black ball is hoisted to the fore lower mast-head, an elevation of 40 feet above the water. A *fixed bright* light is exhibited, at an elevation of 33 feet above the sea, from this vessel; it is visible 10 miles in clear weather, but owing to the frequent mist about the horizon the light is often passed within a short distance without being discerned. The vessel often drifts out of position. When she has pilots on board, a red and white (diagonal) flag is shown forward. Light-ship, latitude 35° 8' 30" S.; longitude 57° 8' 30" W.

In proceeding northward, about the time Indio point is lost sight of, bearing about S., the village and church of Magdalena come in sight, bearing about W. The most prominent *ombu* trees seen are in the vicinity of Magdalena, and farther on the village and church will be seen, surrounded by trees. The church stands on a slight elevation 2½ miles from the coast, 17 miles north-westward of Indio point; it is a large white building, with a round white dome on one end and belfry on the other, and is visible 14 miles, being the most conspicuous object on this coast. Magdalena.

Embudo point, situated 19½ miles N. 40° W. of Indio point, may be recognized by a reddish building near to the coast, which is very low and uniform. A small creek empties into the estuary close to the point; small vessels enter it to load hides and tallow at the *saledero*. There is a depth of 4 feet over the bar at half tides. Embudo point.

Soundings.

The edge of the coast bank is very irregular in its trend from abreast of Indio point to abreast of Embudo. The limit of 3 fathoms depth is between 7 and 5 miles off shore, that of 2 fathoms being about 3 miles; the bottom is shelving, but changes rather abruptly from hard mud on the bank to soft mud and ooze in the channel. Abreast of Embudo the bank becomes narrower, and the edge lies about 3 miles from the land as far as Santiago point.

Atalaya point.

Atalaya point, situated 12 miles NW. by W. of Embudo, is low, sandy, but little salient, and very hard to recognize. The land bordering the coast is swampy, and so uniform in appearance that it is difficult to establish the position by landmarks. There is, however, an isolated *ombu* tree, which is very conspicuous from the northward, situated 3 miles westward of Embudo, and a clump of tall bushes, about the same distance southeastward of Atalaya, both of which are well known landmarks to the pilots and coasting captains.

Atalaya river and bank.

The Atalaya river flows into the bight immediately westward of the point; it is very shallow, for boats only can enter it at half tide. The bank bordering the coast becomes abruptly shoaler eastward of Atalaya, and forms an irregular shoal of 6 to 8 feet; the outer edge lies $3\frac{1}{2}$ miles from the shore, where there is a depth of 21 feet, mud bottom; this decreases rapidly to 15 feet within half a mile of the bank, and in some places the change is abrupt from 13 and 14 feet to 6 and 7 feet on the bank. The shoalest part lies exactly on the range (10 miles) of Chico light-ship.

Chico light-ship. latitude $34^{\circ} 4' 30''$ S.; longitude $57^{\circ} 34' 00''$ W.

A light-vessel is moored in $5\frac{1}{2}$ fathoms, $11\frac{1}{4}$ miles NE. by E. from Atalaya point, and three-quarters of a mile from the northern extremity of Chico bank. The hull is painted red; the vessel has two masts, with stump topmasts. She exhibits, at an elevation of 35 feet above the water, a *fixed bright* light, visible 10 miles in clear weather. The position of this vessel is frequently changed by the violent currents, and gales from the southward and eastward. In 1873, she was sunk during a gale, but since then she has been either raised or replaced.

Remarks.

The following description of this part of the coast was written by Aizpurua, in 1826, and as there have been few changes, the mariner may find it useful.

“Indio point may be recognized by two clumps of trees on the southern side; the point is low and covered with

stunted bushes, more scattered than on the coast to the southward. On the extremity there is a tall tree, and between the wooded part and the extremity there is an uncultivated plain. The depth of water is 21 feet at 9 miles from the point; the land is visible about this distance. When approaching from the eastward the locality is more easily recognized by the quality of the bottom, which, from very soft mud, gradually becomes hard and sticky, and finally, after a short interval, changes to *tosea*, mixed with the sticky clay, the depth decreasing a little. This change from soft mud to sticky clay invariably occurs on the edges of the *tosea* banks; but on the edges of the sand-banks the mud becomes mixed with the sand without being sticky. The depth of water and draught of the vessel must be the criterion for a nearer approach to the point. After having passed it, in proceeding northward, the scattered bushes which crown the hillocks from Magdalena to Atalaya will soon come in sight. It is difficult to recognize the different points, for they project a very little, and cannot be approached near enough to obtain a good view. The lead must be the only guide for approaching this coast during the night, and it should be kept in constant use, for the currents are more rapid and uncertain in this locality than in any other part of the estuary. The current of the ebb appears to set directly toward the edges of the bank, and vessels have struck on it when it was reasonable to suppose them on the opposite side of the channel.

“The three first *ombu* trees seen after passing Indio point are near the village of Magdalena; the church stands in the midst of a group in latitude $35^{\circ} 05' S$. Abreast of this village the shore forms a slightly projecting point. Having passed the church, the first mark seen is an *ombu* tree, surrounded by a small cluster of bushes; farther along, three more *ombu* trees close together; the western is the tallest, the center one the smallest. Next, two openings of the shore; and, finally, Atalaya point, marked by an isolated tree and two houses.”

At the termination of the low coast the Santiago woods commence, and extend 9 miles to the westward, where the coast turns to the southward and forms Barragan bay. The bay owes much of its importance to an inlet opening into it, which was formerly very much frequented; but, owing to

Barragan bay.

- the accumulation of sediment and the general decrease in the depth to 10 feet at the present time, none but coast-
- Santiago point, ing vessels frequent it. Santiago, the eastern point, is very low, covered with trees and fringed by a shallow bank, extending 2 miles off shore, where there is a depth of 10 feet; it is prolonged to the westward by a sand-spit, extending 1 mile from the N. point of the entrance to the inlet, at the extremity of which there is an abrupt change in the depth from 3 to 7 feet. The southern shore of the bay is also fringed with a shallow bank, which occupies the greater part of the mouth of the inlet, and extends to the westward as far as Lara point, the western termination of the bay. The breadth of this bank averages half a mile; the soundings change abruptly from 7 to 10 feet along the edges to 1 or 3 feet on the bank. Lara point is a little higher than the neighboring coast; it is well marked by a large *ombu* tree near the extremity, by being thickly wooded with low bushes, and by a conspicuous white house near the shore, about 1 mile to the eastward. In 1871 there was a wreck about $1\frac{1}{4}$ miles from the extremity of the point; it had one mast standing, and was visible about $3\frac{1}{2}$ miles. The wreck lies in 14 feet, and is dangerous to vessels entering Barragan bay from the westward.
- Lara point.
- Wreck.
- Santiago bank. Santiago bank lies northward of the bay; it is 4 miles in length in a direction parallel to the coast-line, and about 2 miles in width. The depth of water in this space is from 3 to 5 feet less than that over the coast bank, and 2 to 3 feet less than it is in the bay. The bottom is sand and mud, with occasional patches of *tosca*. In the bay it is soft mud.
- Landmarks. A grove of five poplars, situated about 1 mile eastward of Santiago point, is the best landmark for Barragan bay. A battery, in ruins, close to some white houses, an isolated poplar tree, and a clump of bushes on the summit of the highest of a line of hillocks in the interior, are the only conspicuous objects in the locality. The hillocks are about 100 feet in height; the western is the highest, and on the middle one there is a small white house.
- Directions. The anchorage in the bay may be approached on either side of Santiago bank. To pass to the eastward, bring the clump of trees near to the white house eastward of Lara point to bear W., and steer for it on this bearing; to pass to the westward, bring the same mark to bear S. $\frac{1}{2}$ E., and

steer for it. Anchor when a suitable depth is reached, and if you have no pilot, send a boat in to mark the channel into the creek, there being no buoys nor leading-marks. A vessel drawing 9 feet may cross the bar at low water; the depth inside varies from 10 to 17 feet.

It is high water, full and change, in the entrance at 7^h; the rise and fall depends on the direction of the wind, and varies from 5 to 9 feet. Variation in 1874, 9° 54' E.; annual decrease 3'.

The village stands on the southern shore of the creek, about 1 mile within the entrance; it is a growing place, with about 1,000 inhabitants. It is contemplated to deepen this port, and construct piers and wharves, so that vessels may load and discharge their cargoes without the difficulty and delay attending this operation at Buenos Ayres. A railroad now connects it with that city, and there is every prospect of a change for the better.

Quilmes point lies 10½ miles westward of Lara point; the intervening coast is very low and often overflowed; it forms a double bend, with a rather salient point, named Colare, about midway between. The land rises a little near to Quilmes point; a short distance to the westward there is a conspicuous cluster of brush-wood, and on the summit of the table-land, a short distance from the shore, stands the cathedral and a number of buildings. When abreast of Quilmes, the houses of Buenos Ayres and shipping at anchor in the roads may be seen, in clear weather, during the day; and at night the guard ship and custom-house lights should be seen soon after it is passed. The coast to the westward continues low as far as the Riachuelo, 8 miles NW. by W. of Quilmes; the country is being rapidly built up in villas and suburban towns along the line of railroad.

The coast westward of Barragan is fringed with shallow water. The limit of 18 feet depth lies 5 miles from the land abreast of Lara point, 3½ miles abreast of Quilmes, and 7 miles eastward of Buenos Ayres. Inside of this the depth decreases with some regularity toward the shore, except in one place, where there is a shoal of 12 feet, with a channel of 16 feet between it and the coast. This is Lara bank; the southern end lies 3½ miles NNW. ½ W. from Lara point, the northern end 4 miles ENE. of Colare. There is a depth of 20 feet within three-quarters of a mile of the northern edge.

Tides.

Variation.

Village.

Quilmes and
Colare points.

Lara bank.

Light-ship, latitude $34^{\circ} 35' 30''$ S.; longitude $58^{\circ} 13' W.$

A guard-ship, from which a *fixed bright* light is exhibited from sunset to sunrise, is moored in 15 feet, with the Ricoleta bearing W. and Isla point SW. $\frac{1}{2}$ W. The hull is painted black; the vessel has two masts; the light is elevated 22 feet above the sea, and is visible 7 miles in clear weather, but very difficult to distinguish from the lights on the vessels in the roads. There appears to be no exact position designated for this vessel, but the pilots assert that she is moored about half a mile from the southern end of the outer road.

Lighthouse, latitude $34^{\circ} 36' 28''$ S.; longitude $58^{\circ} 22' 19'' W.$

From the tower on the custom-house there is exhibited, at an elevation of 127 feet above the level of the sea, a *fixed bright* light, visible about 8 miles in clear weather. The apparatus is a cluster of thirteen common gas-jets in a glass cupola; the lower tier of glass is alternately red and green below the plane of the light. The remaining or upper part is white, very dirty, and apparently very much neglected. There is no harbor or roadstead in the world of so much importance so miserably lighted and buoyed.

BUENOS AYRES.

Anchorage.

There are two anchorages off Buenos Ayres, formed by the City and Camaron banks, extensions of the Great Palmas flat, which occupies the head of the estuary. The

Outer road.

Outer road is $3\frac{1}{2}$ miles in length, 3 cables in breadth, and from 19 to 22 feet in depth at mean low water. The bottom in this space is soft mud, around the edges mud and sand, and on the banks sand predominates. In 1871 this road was strewn with wrecks; there were so many that the best-informed pilots could not point them all out; the masts of a few were still standing; over others small spar-buoys had been placed; and over all there is generally a ripple on the surface, which the practiced and observant seaman would be likely to notice during daylight. There are always a large number of vessels at anchor in this roadstead; this, together with the danger of striking a wreck, and the necessity of depending on the compasses, with no distinct or near objects for bearings, render it advisable not to move about after dark. The pilots generally refuse to do so. It frequently happens that the vessels are so numerous as to make it difficult to select a good berth. In doing this, avoid getting too near the edges of the flats,

keep clear of the moorings of other vessels and the wrecks, and, if possible, have no vessel near you bearing between SSE. and ESE. The deepest water and best anchorage lie under the following bearings: Custom-house tower, S. 38° W.; guard-ship, S. 30° E.

The bar is the flat comprised between the 3-fathom limit of soundings and the southern end of the Outer roads. At ordinary stages of the estuary there is a depth of 15 feet at mean low water and 18 feet at high water; but it frequently happens that there is as little as 12 feet, which obliges vessels over this draught to anchor 7 miles from the town, in 17 feet, with the Residencia, in the southern part of the city, bearing WSW. Bar.

The U. S. S. Portsmouth crossed the bar, in 1871, drawing 17½ feet. She struck on the eastern end, backed off, and anchored in 18 feet; during the night the water rose 4 feet, and when crossing the bar the least depth found was 18½ feet.

The Inner road lies off the NE. angle of the city; it is 1½ miles in length, 2 cables in width, and 12 to 14 feet in depth. The bottom is soft mud in the road, but on each side it is hard; between it and the coast, the bottom shelves gradually up to a bank of rotten-stone, which fringes the shore from abreast of the convent of San Francisco to the Recoleta. This roadstead is always crowded with small craft and river-steamers; wrecks were so numerous formerly that vessels were commonly injured by them; but the Argentine government has had the most dangerous ones removed, and the anchorage-ground is considerably increased in size. Inner road

The Pozos is northward of the city; the depth in it is 1½ feet more than in the Inner road; but few vessels anchor here, as the same draught can be carried into the Inner road. The Pozos.

There are two routes for crossing the City bank from the Outer to the Inner road. The deepest is known as the Catalina channel; it is much used by vessels under 10 feet draught, but when there is any sea running, the bottom being hard, there is danger of injury to the hull. The leading-mark through is a large white house, with an arched piazza, near Palermo Chico, bearing W. by S. ¼ S. A stranger would find it difficult to recognize this mark, and Directions.

as the bank shifts, and wrecks are to be avoided, it would be better to hire a pilot, who will be useful in selecting a good berth.

The northern channel is 4 miles longer, but is used by the pilots on account of the bottom being soft. It would be difficult to indicate exactly the route they follow; but they steer through the Outer road its entire length; on shoaling the water about 4 feet, after reaching the northern end, they continue on a course parallel to the line of shipping in the Outer road, until the Recoleta church bears SSW.; the depth will, in the mean time, have decreased 4 feet more. The course is then changed to the westward, about W. by S. $\frac{3}{4}$ S., which will be about the bearing of a conspicuous grove of poplars near the shore, northward of Palermo. In a short time after changing the course, the water will shoal 3 feet more; as soon as it has deepened again 3 feet, change the course to the southward, about S. by E. $\frac{1}{2}$ E., and steer for the largest vessels in the Inner road. The depth of water along this course will be found to increase about 2 feet, until you get within half a mile of the shipping, when it will decrease again until the road is reached. The foregoing is a translation from manuscript directions for this route, kindly furnished by an Italian pilot in Buenos Ayres. He stated that the pilots depended more on the increase and decrease in the soundings than in the actual depth; and they gave very little attention to shore-marks, as they were usually too indistinct to be recognized with ease.

Character of the bottom.

The general character of the bottom on the Palmas flat is a dark, fine sand; between depths of 12 and 15 feet it is hard and soft in alternate ridges, being hardest where the least water is found; between the depths of 15 and 18 feet the sand is mixed with soft mud, and above 18 feet mud prevails.

Boca bank.

The Boca is a bank of 4 to 5 feet depth, which lies parallel to the shore in front of the city, but detached from it by a channel of 7 to 9 feet depth, in which there are a great many wrecks. This bank is dangerous to boats plying between the shore and vessels in the outer roads; the cockswains should be instructed how to steer in so as to clear the northern end.

Riachuelo river.

The Riachuelo river, with a depth of 13 to 16 feet at low water, is situated 1 mile southward of Buenos Ayres, and

Socorro

Recoleta

White house

(Catalina Channel leading mark is the White house near Palermo Chico bearing S W. $b W. \frac{1}{2} N. 1 \text{ mag}$)
Palermo Chico is a large white house with an arched piazza.

serves as a port for the lighters and coasting-craft. This river being the deepest on the southern coast, the town of Buenos Ayres was founded near its mouth. The entrance is obstructed by banks, so that vessels drawing over 8 feet seldom get inside, although those of greater draught have been taken in for repairs during the high tides caused by SE. winds. The banks of the river are occupied by workshops, store-houses, *saladeros*, and other buildings, where the products of the country are prepared for shipment. The *saladeros* are principally established at Barracas, a suburb situated about 2 miles up the river.

The ship-yards of Buenos Ayres are located on the banks of the Riachuelo; they contain everything necessary to execute extensive repairs, but labor being expensive the prices are exorbitant. The refuse from the *saladeros* becomes at times an unbearable nuisance.

When approaching the landing-place, care should be taken to avoid the rocks scattered along the shore, between the gas-works and the custom-house pier; also the north end of the Boca, which is always dangerous during fresh winds. The sea-end of the northern pier in line with the custom-house tower leads in clear of all dangers. During the summer, when strong SE. winds prevail, the greater part of the day-communication with the roads is often interrupted by the sea; but in winter, when SW. winds prevail, the sea is generally quite smooth. In 1871 there were three steam-launches which made regular trips between the Outer roads and city four times a day. By giving notice the steamer will come near to the vessel, and, if permitted, in smooth weather will touch alongside.

Landing-place.

Communication.

The harbor is crowded with large clinker-built sail-boats, decked over and fitted for heavy weather, which are employed in transporting cargoes. Steam-barges are also becoming numerous. A problem of the deepest interest to the merchants of this city is the increasing necessity of a more economical method of landing and shipping cargoes. Several schemes for the improvement of the port have been proposed, but so powerful is the influence of the lightermen and draymen that no law can be passed which would result in changing the present system.

There are two piers in front of the city; one is of wood, and extends about 2,000 feet to the eastward from the cus-

Piers.

tom-house; this is used for landing merchandise. The other is of iron, and starts from a point a short distance northward of the preceding, extending out 1,300 feet, to a depth of 5 feet at ordinary stages of the tide. It is proposed to construct another from the NE. angle of the city to the edge of the Inner road, where there is a depth of 12 feet.

Winds.

Easterly winds prevail in the roads of Buenos Ayres during the summer from August to March, with occasional interruptions by squalls from the SW., and hot, dry winds from the NW. Westerly winds prevail in winter; these are occasionally interrupted by gales from the SE. quarter, which are very destructive to the shipping.

Tides.

It is high water, full and change, at Buenos Ayres at 12^h. when the weather is fine and the wind light and variable. The flood lasts five hours, the ebb seven; the average rate of the tidal current is 2 miles an hour. The water rises from 3 to 10 feet; SE. winds cause a rise, NW. winds a fall, and the difference in the level is often 14 feet, and sometimes as much as 20 feet. The whole extent of the City bank has been dry on several occasions, and carts have been driven to the edge of the Inner road to receive cargoes. During the last twenty years the Inner road has been dry on four different occasions. The extremes are, however, of very rare occurrence, and result from a continuous NW. wind at times when the rivers above are at their lowest stages. During a brief visit to the Outer roads, in 1871, there was on two occasions a depth of 36 feet where the chart gave only 22 feet at mean low water.

ARGENTINE REPUBLIC.

Boundary.

The Argentine republic, (*republica Argentina*), an independent state of South America, extending from 21° to 41° S., and from 53° to 71° W., is bounded on the north by Bolivia, east by Paraguay, the Brazilian empire, Uruguay, and the Atlantic ocean; south by the same ocean and Patagonia, and west by the republic of Chili. The question of the ownership of the Patagonian territory is still disputed by Chili and the Argentine republic, but with some prospect of settlement. Paraguay has been forced to yield her claim to that part of the Grand Chaco south of the Pilcomayo river; and the boundary question with Bolivia still

remains unsettled. The estimated area of the undisputed territory of the republic is 591,000 square miles. Area.

The united provinces of the republic are in number 13, and form three groups, divided as follows: Divisions and population.

Eastern or littoral:

Buenos Ayres, population in 1869.....	495, 107
Santa Fé, population in 1869.....	89, 218
Entre Rios, population in 1869.....	134, 235
Corrientes, population in 1869.....	129, 023

Northern:

Cordoba, population in 1869.....	210, 508
La Rioja, population in 1869.....	48, 746
Santiago del Estero, population in 1869....	132, 898
Tucuman, population in 1869.....	108, 904
Catamaraca, population in 1869.....	79, 962
Salta and Jujuy, population in 1869.....	129, 295

Western:

San Luis, population in 1869.....	53, 294
Mendoza, population in 1869.....	65, 413
San Juan, population in 1869.....	60, 319

Total 1, 736, 922

The above includes the independent native tribes. If the district of the Grande Chaco and Patagonia were included, the number of inhabitants in 1869 would be 1,877,290; to which may safely be added ten per cent. for the total number of inhabitants at the present date, (1874.) The population of Buenos Ayres, the capital city, was 177,787 in 1869; it may now be safely estimated at 215,000. The number of foreigners in the republic in 1873 was at least 300,000.

Next to the United States the Argentine republic receives the greatest number of European immigrants. Emigration to the Plata dates from 1825, having commenced shortly after its emancipation from colonial rule. The influx of foreigners was inconsiderable until 1856; in this year measures were taken to encourage it, and ever since the current of immigration has been steadily increasing. In the ten years ending in 1872, the total number of immigrants was 234,000. In 1856 only 4,000 arrived; during the first eight months of 1873, 40,000 arrived in the republic. Of these more than half Immigration.

were Italians, while French and Spanish each stand for seventeen per cent. nearly ninety per cent. of the whole being of the Latin races. A large proportion of the Italians return to their native country as soon as they have accumulated a sum sufficient to maintain them for life. In 1872, 8,253 persons returned to Europe. The proportion of the sexes is eighty per cent. of males to twenty per cent. of females.

Description.

The vast territory of this country forms an oblong quadrilateral, the W. side of which is bounded by the Andes for a distance of 1,300 miles. In some places lateral branches from these mountains extend eastward 150 to 200 miles. The eastern portion of the country around the Paraguay is slightly elevated and undulating; and there are a few chains of low hills scattered over the southern part. But the mountainous tracts form but a small portion of the whole territory, which is, generally speaking, an immense plain intersected with numerous rivers, forming the most wonderful system of inland water communication in the world. For a description of the more important rivers, see "Affluents of the Plata," at the end of this book.

Climate.

In so extensive a region there must naturally be a great variety of climate, yet there is one characteristic throughout, namely, dryness. Nowhere in the country, except on the Andes, is there an extremely warm or cold region.

Natural productions.

The natural productions of the country are as various as its climate. The animals include the guanaco, tapir, puma, jaguar, and ounce. The birds are of great variety, including ostrich, condor, vulture, three species of partridge, parrots, and an immense variety of game. The plains present but scanty vegetation and few species; and these, of course, vary considerably from N. to S. There are, however, great quantities of valuable timber, especially along the banks of the Parana and the other rivers, increasing in variety as you proceed to the northward and toward the mountainous region. The peach-tree is grown for fuel on the islands bordering the head of the estuary. A variety of fruit is also grown, but the agricultural productions are insignificant. In Mendoza the grape finds a congenial soil and climate, but it is little encouraged.

Products.

The chief products of the country are such articles as are derived from immense herds of cattle, sheep, and horses.

The export returns for 1872 embrace sixty-nine distinct items, thirty-two of which are subject to duty, while the remaining thirty-seven are free. The following table presents a comprehensive view of the exports :

Articles.	Quantities.	Value.
Wool..... pounds.	203, 610, 000	\$16, 352, 122
Sheep-skins..... do..	72, 970, 000	4, 158, 864
Hides..... do..	3, 121, 758	10, 571, 710
Jerked beef..... quintals	916, 520	2, 110, 914
Tallow do..	1, 182, 240	7, 427, 901
Horned cattle..... head.	162, 428	1, 600, 609
Other animals do..	58, 856	335, 799
Minerals..... quintals.	13, 540	310, 179
Bones, skins, horns		2, 718, 206
Tobacco, flour, &c		156, 888
Total.....		\$45, 743, 192

It is here seen that nearly half the value of the exports is made up by wool and sheep-skins, which together equal the proceeds of the hides, tallow, and jerked beef. The total value of the exports for 1872 was \$45,743,192.

The amount of wool exported doubles every five years. In 1862 it was 58,153,575 pounds; in 1872 it was 203,610,900 pounds. Only one-half per cent. of the wool is washed before exported; and the percentage of dirt is estimated at twenty-five per cent. of the weight. The exports of wool and sheep-skins would show that there were about 70,000,000 sheep in the Argentine republic in 1872. The average annual increase of these animals over and above the slaughter is fully 10,000,000.

The export of hides has increased fifty per cent. within the four years from 1868 to 1872, and that of jerked beef has doubled. The number of the former was 2,142,643 in 1868, and 3,121,758 in 1872; the amount of the latter was 408,988 quintals in 1868, and 916,520 quintals in 1872. The number of horned cattle in the republic is computed to be 15,000,000 head. Recently a great many are fattened for exportation to Chili, and a considerable number are sent to Europe.

One-half the wool goes to Belgium, one-quarter to France, and the remainder is about equally divided between Great Britain and the United States. We also received about

one-third of the hides, the remaining two-thirds going to France, Italy, and England. The latter country takes the greater part of the tallow and about one-half the sheepskins, France taking the other half of the latter article.

In eight years (1862-'70) the exports of the Argentine republic increased *one hundred and twenty* per cent.

Imports.

The imports consist mainly of iron, in the shape of rails, machinery, and all manufactured articles, groceries, fancy goods, &c. The value of the imports for 1872 was \$59,599,143. Of this England sent \$17,000,000; France, \$14,000,000; Belgium, Holland, and Germany, \$6,000,000; the United States, \$4,500,000; Brazil about \$3,000,000; Spain, \$3,000,000; Italy, \$2,600,000; the balance is distributed among the other nations.

Increase of imports.

Large as has been the increase of the exports, that of the imports has lately been still larger. From 1868 to 1872 this increase has been about *thirty-five* per cent., while the exports in the latter year were only twelve per cent. larger than in 1868. In a word, while the aggregate trade of the country only doubles every ten years, the imports are quadrupled in the same period.

Trade.

The gross trade of the Argentine republic with England and France has about trebled in the last ten years; with France it has doubled in the last six years. The trade with Brazil doubled between the beginning of 1870 and end of 1872, and quadrupled between 1863 and 1873. That with Spain and Italy increased about *fifty* per cent. in the ten years, 1863-'73. The trade with the United States remained small and steady until 1872, when there was a slight improvement, with good prospects for the future. The chief articles imported from the United States are lumber, kerosene oil, lard, starch, naval stores, agricultural implements, furniture, street and railway cars, hardware, and tobacco. Of lumber, 70,000,000 feet were imported during the year ending October 31, 1873.

Revenue.

The revenue of the government is raised by indirect taxation, except a trifling tax raised directly in the city of Buenos Ayres. In 1863 it amounted to \$6,478,000; in 1868, \$12,000,000; and in 1873, \$18,172,379. Of the latter about \$13,000,000 was derived from import duties, and \$3,500,000 from export duties. The disbursements for 1873 were \$23,992,975, the deficit being covered by treasury notes.

Expenditure.

Customs tariff.

The following is the tariff in force since January 1, 1873,

The duties are levied on fixed valuations previously agreed upon, and are subject to a further tax of *five* per cent. *ad valorem* on all imports, and *two* per cent. on all exports.

ARTICLE 1. All merchandise from abroad on importation for home consumption will pay an *ad valorem* duty of *twenty* per cent., except the following, which will pay— Importation.

1st. Duty of *twenty-five* per cent. Spirits of wine, beer, liquors, tobacco, vinegar, and wine.

2d. Duty of *ten* per cent. Agricultural implements, coal, iron, (sheet and bar unworked,) wood, worked gold and silver, common salt, silk piece-goods, sewing-silk.

3d. Duty of *three* per cent. Precious stones, mounted or ornamented.

ART. 2. The following articles are *free* of duty: Staves and casks in shooks; articles, in the opinion of the executive, destined for Divine worship; fresh fruits; breeding-stock; ice; printing-presses and accessories; wood and charcoal; printed books; maize and maize-flour by land; machinery for steamers and all those which, in the opinion of the executive, are for the establishment of a new industry, whether in relation to agriculture, mining, or the arts and sciences; furniture and tools, the property of and for the exclusive use of immigrants; gold and silver, coined and uncoined; plants of all kinds; paper unsized or especially for printing periodicals; lithographic presses; seeds intended, in the opinion of the executive, for agriculture.

ARTICLE 1. Duty of *six* per cent. Animal oil; horns; meat cured and salted; horse-hair; cow and horse hides of all descriptions; bones and bone-ash; skins in general, (except sheep-skins,) ostrich-feathers, and grease and tallow. Exportation.

ART. 2. Duty of *two* per cent. on value. Sheepskins, washed and unwashed.

All other articles are free of export-duty. It is proposed to equalize the duties on exports to *four* per cent.

Agriculture is carried on in a very primitive manner, and in many instances may still be seen at work the same form of plow as used by the Egyptians 2,000 years ago. However, the American agricultural implements are rapidly coming into general use, although there is a prejudice against them by the Italians, who are the chief agriculturists. The yield of wheat is steadily increasing, and is at present suffi- Agriculture.

cient to supply home demands; it is, however, of inferior quality, and the finer brands of flour are still imported.

Education.

As regards education, the improvement is very great. In 1862 there were 22,000 children attending the public schools; in 1872 there were 80,000. In 1862 there were two national colleges; in 1872 there were fourteen. And there is also a national observatory at Cordoba, under the supervision of a native of the United States.

Army and navy.

The army of the republic consists of 10,700 men of all branches; and the national guard numbers about 20,000 men. The navy is composed of seven war-vessels of small size; one only mounts as many as 12 guns.

Telegraphs.

All the principal towns of the republic are in telegraph communication with Buenos Ayres. At the end of 1872, the national telegraph department had in operation 2,203 miles; in May, 1873, the number of miles had increased to 4,000, and 1,500 more in course of construction, in addition to the railway lines. Buenos Ayres is also in telegraph communication with Chili, Peru, Uruguay, Brazil, Europe, and the United States.

Shipping.

The shipping entered at all ports of the republic in 1872, was 3,143 vessels, aggregating 1,113,886 tons; and the number which sailed was 2789 vessels, aggregating 1,037,754 tons. The latter belonged to the following countries: Great Britain, 712; Italy, 267; Uruguay, 256; Spain, 206; Germany, 202; United States, 122; Brazil, 99; Portugal, 30; Austria, 22; Argentine republic, 481, miscellaneous, 492. More than one-

Steamers.

half of the commerce of the country is carried on in steamers, the aggregate tonnage of which is 1,110,496, out of a total of 2,151,640 tons. The government offers an annual subsidy of \$40,000 to any line of monthly steamers between the republic and the United States.

Railways.

There are at present seven lines of railway opened for traffic, and one, if not already opened, very nearly ready. Nine lines more are projected of a total length of 1,900 miles. Those already opened are: 1. *Central Argentine*, from Rosario to Cordoba, a distance of 247 miles. There is a project to continue this road up to Tucuman, and thence across the Andes; the surveys are all concluded. 2. *Southern Railway*, from Buenos Ayres to Chasomos, 73 miles; to be continued to Dolores. 3. *Northern Railway*, from Buenos Ayres to Las Couchas; whole length 16 miles; to be continued

45 miles farther. 4. *Western Railway*, from Buenos Ayres to Chivileoi, 100 miles. 5. *Merlo and Lobos Railway*, 45 miles. 6. *Buenos Ayres, Boca and Barracas Railway*, 16½ miles; add, if not already completed, is being rapidly pushed on to Ensenada, 28 miles from Barracas. 7. *Gualeguai and Porto Ruiz*, 6½ miles.

Grants have been made for nine new lines, as already stated, with little less than 1,900 miles of track. The lines authorized in 1872 will cost nearly fifty millions of dollars, on which the state has guaranteed seven per cent. interest, from twenty to forty years, according to the road. Projected rail-ways.

The public debt of the Argentine republic, according to the official returns at the end of December, 1872, was \$15,036,303. In addition to this there is a floating debt of nearly \$6,000,000 in treasury bills. Public debt.

The silver dollar, or *patacon*, of one hundred centesimos, has an average rate of exchange equal to ninety-six cents American gold. The *peso*, paper currency, averages four cents. One hundred and twenty-two and a half pesos are about equal to an English sovereign. Moneys.

The *quintal* is 101.40 pounds avoirdupois; the *arroba* is 25.35 pounds avoirdupois; the *fanega* is 1½ imperial bushels. Weights and measures.

The metrical system of weights and measures has recently been adopted. Although in use in all the custom-houses, it will be a long time before the system becomes popular.

The United States has a treaty of commerce and navigation with the Argentine republic, which was concluded in 1853. By this treaty the United States is allowed the free navigation of the Parana and Uruguay, wherever they belong to the Argentine republic. The two nations agreed to use their power to prevent the island of Martin Garcia from being retained by any state of the Plata which shall not adhere to the principles of the free navigation of these rivers. Treaty.

HISTORICAL SKETCH.*

The Rio de la Plata was discovered in 1508 by Juan Diaz de Solis; and as early as 1535 Don Pedro de Mendoza began the settlement at Buenos Ayres, while the country as far N. as the site of Asuncion, the present capital of Paraguay, was Discovery.

* Compiled from American Cyclopaedia.

Settlement.

explored by parties under his orders. Many colonies were founded in that century, and much progress was made in the civilization of the Indians under Don Juan de Caray, who was in 1580 appointed lieutenant-governor of those provinces, which were then regarded as forming a part of the vice-royalty of Peru. In 1620 a new government was formed, having for its capital Buenos Ayres, hitherto dependent upon the government of Paraguay, and both continued under the vice-royalty of Peru until 1776, when the vice-royalty of Buenos Ayres was created, comprising the territories known as Bolivia, Paraguay, Uruguay, and the Argentine republic.

In 1806 Buenos Ayres and Montevideo were captured by a small British force, which, however, was soon compelled to relinquish the conquest. An attempt was made in August, 1807, by a British army, 10,000 strong, to reconquer the city of Buenos Ayres, but the invaders were defeated.

War for independence.

The struggle for independence was begun about three years later, and was waged on both banks of the Plata, until the only remaining Spanish force surrendered in Montevideo in 1812. During this period the war of independence was also going on in upper Peru (Bolivia) with varied results, and in the adjacent provinces the Spaniards suffered considerable reverses in Salta and Tucuman.

Formation of the government.

In January, 1813, the chief power was vested in a "sovereign assembly" formed in Tucuman, then the seat of government. About the same time General José de San Martín, the governor of the province of Mendoza, conceived the project of crossing the Andes for the purpose of driving the Spaniards out of Chili. The enterprise proved successful, and Chili was freed after the battles of Chacabuco and Maipú, (1817-1818.) Immediately afterward the Chilians and Argentines carried their united arms into Peru, and entered Lima in 1821.

The independence of the united provinces of the Plata was declared in Tucuman on July 9, 1816, in which city, after the dissolution of the sovereign assembly, a congress had assembled March 26, 1817, and promulgated a provisional constitution; General Puyrerredon being named supreme dictator.

The seat of congress was afterwards removed to Buenos Ayres, in the hope of securing greater liberty of action, but

in 1820 the directory fell, and in the following year a democratic form of government was established. The riverine provinces soon united themselves with Buenos Ayres, and this alliance led in 1824 to the organization of the republic.

Brazil forced the united provinces into a declaration of war, and blockaded the city of Buenos Ayres, January, 1826; ^{War with Brazil.} and, though the Argentine arms were for a time victorious by sea and land, the event served to prove the weakness of the union.

The varied character and interests of the inhabitants, together with the want of a rapid and easy means of communication between the provinces, led to a national disturbance, which resulted in the temporary triumph of the wealthy and educated classes, who succeeded in forming the constitution of 1825. Rivadavia was the first and only president of the confederation under this constitution.

The greater part of the large province of Buenos Ayres ^{Rosas.} took its political bias from the independent tone of the cattle-drivers and herdsmen. They soon found a leader in Juan Manuel de Rosas. Untutored in the arts of refinement, and at once daring in the highest degree, ambitious, and cunning, he soon found numerous supporters among the masses of the people, and especially after he had succeeded in extending the limits of the province of Buenos Ayres, by subduing the savages of the pampas and other indigenous tribes. No sooner had he espoused the cause of the federalists, than his popularity spread to the provinces. He had opposed the constitution of 1825, although unsuccessfully; but in 1827 he had acquired sufficient influence, and found himself certain of the aid of other popular chieftains. They protested against the constitution of 1825, and took up arms in force in support of their protest. Rivadavia, seeing himself powerless to maintain the constitution, and aware that he could neither carry on the war against the Brazilians nor obtain a peace, resigned power, and Rosas and his colleagues chose Dorrego governor of Buenos Ayres.

Dorrego made a treaty of peace with Brazil, through the ^{Peace with Brazil.} mediation of England, in 1828, from which year dates the recognition of the Banda Oriental of Uruguay as an independent state, under the triple guarantee of Great Britain, the Argentine republic, and Brazil.

Confederation
of the provinces.

Insurrection.

A confederation, based upon voluntary alliance, was formed in January, 1831, between the provinces of Buenos Ayres, Corrientes, Entre Rios, and Santa Fé, which were soon joined by the other provinces. But some of the officers who had commanded in the late war, now began to regard with distrust the triumph of federal principles under Dorrego and the other governors; and the established army of the republic set on foot a counter revolution, headed by one Lavalle, an officer of some distinction. Lavalle defeated Dorrego and Rosas, and shot the former without a trial. Rosas, however, with Guirogo, of La Rioja, and Lopez, of Santa Fé, formed a new league and overthrew Lavalle, who resigned his post, Rosas being chosen in his place, which he held till 1832.

Rosas dictator.

Two governments, the first under Balcarce, and the second under Viamont, now followed each other in the space of a few months, neither being able to maintain itself, as Rosas held the army under his control. After the fall of Viamont, Rosas was re-elected governor of Buenos Ayres. His term expired in 1835, when he refused to be again a candidate. Five times the honor was tendered to him, and as often refused. He was then offered the dictatorship for five years, which he accepted, and the appointment was twice renewed. He held the office until 1852, and was the sole and uncontrolled ruler of Buenos Ayres, and practically of the Argentine republic, during the whole of that time. From 1827 to 1852 there was no meeting of the national congress or constituent assembly. Rosas has been represented as an arbitrary and bloody tyrant, and accused of the treacherous murder of all the friends who placed him in power.

War with Uruguay,
Paraguay,
and Brazil.

With the idea that all the provinces of the former viceroyalty of Buenos Ayres belonged to the Argentine republic, a contest was long kept up to attempt to bring into it the states of Paraguay and Uruguay. The former, protected in part by its natural position, and more by the policy of isolation and strong executive power of its singular dictator, Francia, almost entirely escaped foreign conflict. But Brazil had ever in view the conquest of the latter, while the Argentine government saw the importance of that territory, and especially the necessity of checking the ambition of the neighboring monarchy. The civil dissensions in the Banda Oriental exercised a marked influence

on Argentine politics. The matter came to a war, first, of blockades and then of armies, between Oribe supported by Rozas on the one hand, and Rivera sustained by the Argentine exiles in Montevideo, and also by a French fleet, on the other. The intervention of the French was induced by a quarrel which had arisen between a French vice-consul and the dictator. The French difficulty was settled by the appointment of a new consul, and in 1840 peace was concluded between the confederation and Montevideo.

Intervention of the French.

Peace with France and Uruguay.

This peace was not of long duration, and in 1845 Great Britain and France, at the special request of the Emperor of Brazil, interfered on the plea of enforcing the treaties of 1828 and 1840. The allies blockaded Buenos Ayres; seized the Argentine fleet, then engaged in blockading Montevideo; and the island of Martin Garcia, which commands the entrances of Paraguay and Uruguay; opened the Parana, which Rozas had closed to vessels bound to Paraguay; and offered convoys as far as Corrientes, where, in repeated attempts by the dictator to oppose the passage of the combined fleets, the Argentines sustained heavy losses. This state of things lasted three years, at the end of which period England withdrew, (July, 1848,) but France continued hostilities six months longer.

Blockade of Buenos Ayres.

The rival factions in Uruguay, one of which was supported by Brazil and the other by Rozas, occupied the latter many years, while the opposition party in his own State was gradually becoming too powerful for him. This party, headed by Urquiza, governor of Entre Rios, was now armed and acting in conjunction with the enemy, and at the battle of Monte Caseros, February, 1852, Rozas was defeated and escaped to England.

Rosas overthrown.

Vincente Lopez now became provisional governor of the province of Buenos Ayres. But, by a sudden *coup d'état*, Urquiza, having the army at his disposal, put himself at the head of the government, as dictator, not five months after the deposition of Rozas. The first use of his power was to acknowledge the independence of Paraguay. He also secured the future free navigation of all the rivers flowing into the Plata—a wise measure, which still remains in force. But this new assumption of dictatorial power produced immediate irritation. Having to attend congress at Santa Fé, he had hardly left the capital when (September 11, 1852,)

Urquiza dictator.

a revolution broke out, and Valentine Alsina was chosen governor of Buenos Ayres.

Buenos Ayres
secedes.

The province of Buenos Ayres with this government determined to maintain itself as a state independent of the confederation, and another revolution in December, which temporarily changed the government, did not alter this purpose. The congress of the confederation did not assemble till November 20, all the states being then represented except Buenos Ayres, and Urquiza was instructed to suppress the rebellion in that state. It again met, January 22, 1853, and went on with the work of forming a constitution. It also recommended the President to take all means to stop the civil war and bring Buenos Ayres back to the confederacy.

New constitu-
tion.

The new constitution of the confederation, which was still in force, was promulgated May 1, 1853. It was framed in apparent expectation that Buenos Ayres, the richest and most important, as the only maritime, state of the confederacy, might be induced to return to it, and accordingly fixed that city as the capital. The constitution, with some slight modification, was copied from that of the United States of North America, as being a federal government of independent states. It guarantees the free navigation of the rivers, and provides that there shall be no duties on goods carried from province to province; grants to foreigners all civil rights; provides for their naturalization after ten years' residence, which term may be abridged at the discretion of congress; and makes other provisions for the encouragement of immigration. It went into effect at the end of the year. Urquiza was chosen president for six years from March 5, 1854. The seat of government was established at Bajada del Paraná, in the province of Entre Rios. Meantime in Buenos Ayres a new constitution had also been formed in January of the same year, but not without a hope expressed and provision made for a future return to the confederation, which soon after seemed probable.

Civil dissen-
sions.

That province was invaded by a party of filibusters, and Urquiza was suspected of having fostered the movement. This he promptly denied, and set his forces to help repel them, which friendly act failed to bring about entire reconciliation, but resulted in good-will between the parties, and

two treaties of peace signed at Buenos Ayres, December 20, 1854, and Paraná, January 8, 1855. They provided for independent governments, but contained stipulations for much mutual assistance. Urquiza continued President of the Argentine republic, and Pastor Obligado was re-elected governor of Buenos Ayres for a term of years. Upon the unanimous request of the congress of the confederation, negotiations were opened on the subject of reunion, October 10, 1855, and Juan Bautista Peña was sent to Paraná for the purpose. But the discovery that his authority did not extend to merging the two sovereignties produced much irritation in the confederation, at the same time that another event occasioned discontent in Buenos Ayres. On December 24, 1855, some Argentine refugees from Montevideo disembarked at Santa Fé to invade the province of Buenos Ayres. General Bartolomé Mitre repulsed them, and in his turn invaded the province of Santa Fé, in which step he was sustained by his government. Upon this, not only was the mission of Peña closed, but the Argentine government signified to him (March 18, 1856) that the treaties of December 20, 1854, and January 8, 1855, were annulled. Differential duties levied upon all vessels from Buenos Ayres bound up the Plata and its tributaries gave rise to serious hostilities, which were renewed at intervals during four years, until November 11, 1859, when Buenos Ayres was re-united to the republic.

In 1860 Urquiza was succeeded in the presidency by Dr. Santiago Derqui; and in the following year the expulsion of the deputies of Buenos Ayres from the congress led to the renewal of hostilities. General Bartolomé Mitre defeated the Argentine troops at Bavon, (September 17, 1861,) and was provisionally intrusted with the government, Derqui having abdicated. A convention appointed to revise the old constitution adopted a new one, and appointed Buenos Ayres provisional capital of the republic. In October, 1862, Mitre was elected President. Urquiza in the mean time remained on the defensive in Entre Rios, but was soon induced to accept the government of that province, which had entered into the newly-constituted republic. An insurrection headed by General Peñalosa, who, for nearly two years, held the provinces of Catamarca, San Juan, and Cordoba, terminated in his capture and execution, (1863.)

Paraguayan
war.

In 1864 N. Aguirre was elected president of the Banda Oriental del Uruguay, from the ranks of the *Blancos* or reactionary party, and Venancio Flores, the chief of the *Colorados* or liberal party, and the unsuccessful candidate for the presidency placed himself at the head of an insurrection and readily obtained the aid of Brazil, in spite of the repeated protests of Lopez, President of Paraguay, to the government at Rio de Janeiro.

Lopez now ordered the capture of a Brazilian steamer on its passage up the river to the province of Matto Grosso, and the detention of the crew and passengers as prisoners of war, November 11, 1864. In the following month a Paraguayan army invaded Matto Grosso, sacked Cuyabá, the capital, and five other towns, and took possession of the diamond-mines. Aguirre had applied to Lopez for aid, which was at once promised, but the Paraguayan troops could only reach Uruguay by passing through the Argentine province of Corrientes, and Mitre refused them permission of transit. In 1865, Flores assumed the functions of President, the city of Montevideo being occupied by Brazilian troops. Fearing now, from the attitude of the Argentine republic, that it would join the alliance against him, Lopez seized two Argentine war-vessels in the bay of Corrientes, April 13, 1865, and the next day that city was occupied by Paraguayan forces, who formed a provisional government and declared the provinces of Corrientes and Entre Rios to be annexed to Paraguay. War was declared by the Argentine republic against Paraguay April 16, and a like declaration was issued by Paraguay against the Argentine republic on the 18th of the same month. On May 1, an offensive and defensive alliance was secretly entered into between the Argentine republic, Uruguay, and Brazil, against Paraguay, the allies "solemnly binding themselves not to lay down arms until the existing government of Paraguay should be overthrown." In June the city of Corrientes was re-captured by the Argentines, but was soon after invested again by the invaders. During the first two months the war was chiefly carried on in Corrientes, generally with heavy losses to the Paraguayans, who, however, had by August succeeded in taking one or more towns in the adjacent province of Rio Grande do Sul. But their advancing army on the river

Uruguay, numbering 7,000, was defeated at Yatay, and finally surrendered in Uruguayana, to 10,000 Uruguayans and Argentines. In November following, the Paraguayan army had evacuated the Argentine territory, and the close of December found the allies, 35,000 strong, at Corrales, on the N. shore of Corrientes, ready to cross the Parana and carry the war into the heart of Paraguay. Lopez, commanding in person, was unable to defend his frontiers, and retired northward before superior forces, fighting for every inch of ground. This obstinate defense terminated with the battle of Lomas Valentinas, December 25-27, 1868, having lasted upwards of three years. The war continued, however, until March 1, 1870, when Lopez was defeated and killed at Aquidaban.

In 1866, in some provinces, especially those bordering on Paraguay and Bolivia, great dissatisfaction with the continuance of the triple alliance and the war had been expressed, and repeated attempts made to induce the separation of some of the northern provinces from the Argentine republic; but these disturbances were easily put down. Bolivia, in the same year, protested against the treaty of alliance, asserting her right to a part of the Gran Chaco, claimed in the treaty by the Argentine states. On December 10, a convention, to reform the constitution, met at Santa Fé. The only important measure adopted was the renewal of the permission to congress to levy duties on exports. An insurrection, headed by one Videla, broke out in Mendoza, San Juan, and La Rioja, for the purpose of separating the interior provinces from the republic; it was put down in April, but the leaders escaped. The opposition to the war had been increasing in strength, and was vehemently expressed, in 1868, by Alsina, governor of Buenos Ayres, who denounced the contest as barbarous, murderous, and fatal. A bill which passed congress the same year, to make Rosario the national capital, was vetoed by President Mitre. In April, 1870, a rebellion broke out in Entre Rios, headed by General Lopez Jordan, the first act of which was to murder General Urquiza, Jordan's father-in-law, sack his palace, and confiscate his property. Two of Urquiza's sons were murdered in Concordia; and Jordan, having forced the state assembly to appoint him governor, issued a proclamation of liberty, and appealed to the national government for immunity from

Civil wars.

punishment. It was not until April, 1871, that the national troops succeeded in quelling this rebellion.

Plague.

In March, 1871, the city and neighborhood of Buenos Ayres was visited by yellow fever of the most malignant type; all business was interrupted for about six weeks, and the mortality during the one hundred days preceding April 30 was 26,000.

Controversy
with Brazil.

Toward the close of the year 1871 a controversy arose between the Argentine republic and Brazil, the former having protested against several alleged breaches by the Brazilians of certain articles of the treaty of alliance of May 1, 1865. But General Mitre brought his negotiation to a successful termination in October, 1872. In this year, General Jordan and his followers once more rose in rebellion against the general government, but this movement does not appear to have lasted very long, although a powerful effort and considerable expenditure were required to suppress it.

Revolution.

An insurrection, headed by General Mitre, broke out in Buenos Ayres, October 12, 1874, and terminated two months later by the surrender of its leaders. The excuse was, that the recent presidential election had not been fairly conducted. Stripped of all vague considerations, it may safely be regarded as one more effort, on the part of the Gaucho party, to reduce the republic to a condition of anarchy, and its result a dictatorship. The prosperity and enormous growth of the country during the recent presidential term should be sufficient evidence of the soundness of the principles against which the insurrection was raised.

CITY OF BUENOS AYRES.

Dimensions.

The city of Buenos Ayres, the capital of the province of this name and of the Argentine republic is rapidly becoming, if not already, the most important city of South America. It is in shape a parallelogram, having the long sides from E. to W. All the streets are parallel to the respective sides. The city covers an area of 2,000 acres, and is divided into blocks 450 feet square. The oldest houses are rapidly passing away, and modern buildings of three to four stories are becoming general; the internal arrangements being more in keeping with the needs of modern civil-

Description.

ization. Of the streets, 83 in number, 31 run E. and W., and the remainder N. and S. The pavements and sidewalks are still very dilapidated, but a system of improvement is being carried out which will greatly change them for the better. All the streets are well lighted with gas. Drainage is still unknown. Although situated on the banks of one of the largest fresh-water basins, the city is poorly supplied with good water; nearly all of it being carted from the river. The sanitary arrangements are bad; offal, garbage, and waste water being thrown into the streets, or allowed to accumulate under the dwellings. ^{Sanitary defects.} The plague of 1871, which carried off 26,000 persons, and caused the entire suspension of business during three months, awoke the authorities to the necessity of providing a system of sewerage and water-supply; and in 1872 a contract was signed with a company, involving the expenditure of \$15,000,000, for this purpose. In spite of the defects in sanitary arrangements the general health of the city is good.

There are ten squares, seven hotels, five spacious markets, ^{Squares, buildings, &c.} a great many native and foreign boarding-houses, nine German, one other foreign, and three national clubs; a British circulating library with 2,000 volumes; four theaters; a state library with 18,000 volumes, and some valuable manuscripts; a national library, founded in 1870 by Sarmiento; an emigrants' home; a museum, founded in 1823, said to contain the richest collection of antediluvian fossils on the continent, and perhaps in the world; seventy-three public and ninety-eight private schools; a national college, a university, a theological seminary, a Jesuit college, a French religious college, and several denominational schools connected with the various English, Scotch, American, and German churches; an infant-school, and a number of night-schools, opened in 1871.

There are, in addition to the cathedral, 15 Roman Catholic churches, 6 chapels of ease, and 4 Protestant churches; ^{Places of worship, &c.} two monasteries; two convents; two cemeteries—the Recoleta for Catholics, the English for Protestants; two general hospitals; one each of French, English, Irish, and Italian hospitals, and a sanitary institute, which is the best of its kind on the continent; and a great many other public and private institutions of all kinds.

Police, municipal government, and communication.

The police force is imperfectly organized, and is composed of only 200 men totally unfit for their business. Several lines of horse-cars traverse the city and suburbs. Besides the railways leading into the interior, there is daily communication by steamers with the important river ports, and frequent communication with others. Ten daily papers are published in the city; six in Spanish, one each in English, French, German, and Italian. The municipal government is composed of twelve leading citizens and foreign residents. The city is divided into twelve parishes, each having a justice of the peace.

Need of facilities for landing cargoes.

The want of proper facility for landing and shipping goods has long been a source of complaint to all persons connected with the trade of Buenos Ayres. The cost of landing goods is equal to and often greater than the cost of bringing them from Europe or the United States. With a view of overcoming this difficulty, the government has consulted, and invites plans from, many eminent engineers for the improvement and deepening of the port; but, beyond the construction of two piers, respectively 1,300 and 1,900 feet in length, and the deepening of the entrance to the Riachuelo, nothing has been accomplished.

Shipping.

The custom-house returns of the port give the following as the movement of shipping for 1872 :

Arrivals and departures of sailing-vessels.

Countries.	Number arrived with cargoes.	Tons.	Number sailed with cargoes.	Tons.
Great Britain	216	82, 435	122	42, 695
France	243	85, 381	59	29, 447
United States and Canada	168	79, 911	55	24, 168
Brazil	160	34, 442	106	24, 720
Spain	195	61, 073	.....	.....
Other countries	315	89, 255	434	140, 007
Belgium .....	.....	.....	82	36, 141
Total.....	1, 297	432, 497	858	297, 178

Arrivals and departures of steamers.

Countries.	Number.	Tons.
Great Britain	85	97, 780
France.....	41	48, 858
Italy.....	22	21, 695
Belgium	13	15, 099
Uruguay.....	400	145, 568
Paraguay	91	28, 310
Other countries	51	29, 063
Total.....	703	386, 373

In addition to the above, about 20 sailing-vessels arrived and about 200 cleared in ballast. As regards the cargoes in steamers, it should be borne in mind that all of the steamers to and from European and American ports outside the Plata arrive and sail only partly laden. From the above it will be observed that, even including the arrivals from Uruguay and Paraguay, the half of the tonnage frequenting the port of Buenos Ayres consists of steam-vessels. At the end of 1872 there were no less than 92 large, fine steamers employed in this trade, comprising 13 lines plying regularly between the ports of Europe and Buenos Ayres, and touching at the port of Montevideo and various ports in Brazil.

Remarks.

1. The Royal Mail Steam-Packet Company runs *six* ves-
2. The Liverpool, Brazil, and River Plate Steam Line comprises *twenty four* vessels, rang-
3. The Glasgow and Belgium Line with *twelve* vessels, ranging from 840 to 1,300 tons; of this line there is one each month to Rosario.
4. Another Glasgow line runs *two* vessels of 1,500 tons each.
5. The Hamburg line has *five* steamers of 2,700 tons, with one arrival each month.
6. The Lavarello line (Italian) with *seven* steamers, ranging from 800 to 2,150 tons, with one arrival from Genoa each month.
7. The Italian and River Plate Company with *three* vessels, of 1,040 tons.
8. The Savori (Italian) line with *two* vessels, of 900 tons each.
9. A Havre line (French) with *five* steamers, ranging from 1,730 to 2,500 tons, making one voyage per month.
- 10.

Lines of steam-
ers.

Another Havre line with *seven* vessels, of 800 to 1,000 tons, making one voyage per month. 11. A line of steamers from Marseilles with *four* vessels, of 878 to 1,300 tons, making one voyage per month. 12. The Messageries Maritimes Line from Bordeaux with *six* steamers, of 1,600 to 2,033 tons, making two voyages per month. 13. The Bayonne Line with *one* steamer of 438 tons.

Remarks.

In the year 1872 forty-two British vessels, measuring 18,453 tons, entered from ports of the United States, and seventeen, measuring 9,167 tons, cleared for ports of the United States. As the total entries from ports of the United States were 168 vessels, measuring 79,911 tons, and departures for these ports were 55 vessels, measuring 24,168 tons, it is evident that the English have the carrying of a large proportion of our trade with Buenos Ayres. Freights for the United States ruled during the year 1872 at \$5 per ton, and *five* per cent. per ton of 40 cubic feet, for bales or measurement goods; and five-eighths of one cent per pound, and *five* per cent., for hides and all weighable goods.

Freights.

Supplies.

All articles necessary to the equipment and provisioning of vessels may be obtained at Buenos Ayres. Repairs may be executed above the water-line to vessels at anchor in the roads, but the time lost in transporting the workmen to and from the shore would greatly increase the cost. Coal for any purpose, and of all kinds, may be had, 92,000 tons of this article having been imported during the year 1872.

American
houses.

There are fourteen American houses engaged in business in the city, representing a cash capital of two and a half million of dollars gold. Of these eight are merchants, two *barraqueros*, one grocer, one stationer, one manufacturer, one dealer in American goods in general. There are also nine English houses, six German, two Italian, six native, and one French, which ship to a considerable extent to the United States; but the heaviest shipper is a native.

COAST NORTHWARD OF BUENOS AYRES.

Olivos bay.

Olivos bay is comprised between Retiro point, the north-east angle of Buenos Ayres, and Olivos or San Isidro point, situated 9 miles to the NNW. $\frac{1}{2}$ W. of the Ricoleta. Several small streams empty into the bay. The most conspic-

uous objects on its shores are the palace of Rosas, at present very much neglected, and the village of Belgrano, on an elevated plain about $1\frac{1}{2}$ miles inland.

The delta of the Parana commences at 6 miles NW. by W. of Olivos point, where there is an excellent port in the entrance to the Tigre or Las Conchas river. At high tides vessels of 8 feet draught can reach this port; and in fresh SE. winds many leave the roads of Buenos Ayres to seek shelter in it; but a good pilot is necessary, as all this part of the head of the estuary is occupied by the extensive Palmas flat, on which near the shore the depths are very irregular, the channel is winding and subject to frequent changes. There is as much as 12 to 17 feet in the channel at ordinary high tides, but the navigation is intricate for vessels over 8 feet draught.

Above the Tigre the appearance of the coast entirely changes. It becomes broken into a great many wooded, marshy islands, forming the delta of the Parana. The various outlets are deep, but narrow, winding, and known only to the pilots. Three of them are more frequented than the others; these are the Arroyo del Capitan, Parana de las Palmas, and Boca del Mini. The Parana Guazú, the only entrance frequented by large vessels, lies 25 miles NE. of the Tigre.

PORT AND CITY OF ROSARIO.

The navigation of the estuary is possible without the assistance of pilots as far as Buenos Ayres; but even the most expert seamen and experienced captains must yield to necessity, and secure the services of a pilot before attempting to ascend the rivers. The banks are constantly changing their appearance, and landmarks are obliterated; the channels shift; the currents change their directions; and all nature seems to conspire to prevent the river-navigation by all who do not make it a specialty. The responsibility of the captain lies mainly in securing a good pilot, who combines knowledge and sobriety with energy.

With a pilot on board there would be no use for sailing-directions, to write which would be a waste of time, and to follow them an impossibility. With this belief we proceed to give some general information in relation to the city of

Rosario which will be found useful or interesting to mariners in general.

Rosario.

The city of Rosario, now the second in the Argentine republic, bids fair to become the metropolis of South America; for its position and advantages make it the receiving and distributing center of a vast and wealthy region, comprising the eleven interior provinces of the republic, Bolivia, Paraguay, and the interior provinces of Brazil, through which flow the branches of the Parana. Up to the year 1852 this vast region had no foreign commerce, and, until very lately, the most of it has been with Chili, Bolivia, and Paraguay. In 1853 the population was under 4,000; in 1874 it is not less than 35,000. In 1860 but one foreign vessel entered the port from sea; in 1870 the number which entered was 115, with an aggregate tonnage of 25,832 tons, and the number which cleared was 156, with an aggregate tonnage of 39,127 tons. Of those which entered one only was in ballast; but 113, with an aggregate tonnage of 28,285, cleared in ballast. The closer proximity of Buenos Ayres to the ocean is counterbalanced by the greater facilities which this port possesses for discharging and loading vessels; while the charges are so much less that merchants can sell goods in original packages cheaper than they can be sold at Buenos Ayres.

Growth.

The increase of the custom-house receipts will give a clear idea of the growth of the commerce of the port. In 1854 these were \$340,370; in 1855, \$583,120; in 1860, \$860,685; showing an increase of nearly 50 per cent. in five years. In 1870 the receipts had risen to \$1,467,255, an increase of 150 per cent. in fifteen years; and for the first ten months of 1872 they had reached \$1,635,100. In 1871 the value of the merchandise imported was at least \$12,500,000. Previous to 1871 there were no steamers engaged in the direct trade between this port and those beyond the sea; by the end of 1872 there were two lines of British steamers making regular monthly trips between it and Liverpool; and there are at the end of this year (1874) four lines.

Report of Consul Wood.

The following from the official report of Mr. Thos. B. Wood, United States consul at Rosario, dated September 30, 1873, will repay careful perusal:

The port of Rosario is by nature one of the most conven-

ient of river ports. Though about 350 miles from the sea, it is accessible to large vessels, which ascend the Parana without difficulty, and find here ample accommodations and many advantages. The river presents a sheet of water from 1,000 to 1,500 yards wide to the first tier of islands, with good anchorage, at a depth of from 18 to 28 fathoms at low water, and a variation of from 3 to 4 fathoms between high and low stages of the stream. The river falls during May, June, July, and August, and rises during November, December, January, and February. There is no tide. The difference of level in a year may reach 34 feet, but this is rare. A bluff, 50 or 60 feet high, on which the city stands, with deep water at its foot, is taken advantage of by mooring vessels close under it and loading them by means of chutes or inclined planes, down which the bales of wool, hair, and sheep-skins, as well as the lime, hides, &c., that constitute the chief exports here, can be slid into the very holds of the vessels at any required speed, and with the least possible handling. At the same time, merchandise of all kinds is brought up this bluff by machinery, very cheaply and rapidly. A new custom-house, costing about \$150,000, has been erected; this is the first step in a general plan of public improvements which will add artificial to the natural advantages of the port. Docks and wharves are to be constructed, with a branch track connecting them with the central Argentine railroad, so that the transshipment of merchandise may be carried on as cheaply and rapidly as possible.

The river navigation to this place presents no unusual difficulties. There are three shallow points in the Parana: ^{River navigation.} one at Martin Garcia, where it enters the Plata, the second 25 miles up, at Cruz Colorado, and the third 12 miles farther up, at Rama Negra. Sometimes, at extremely low water, the last two points will not admit vessels of more than 10 feet draught; but such times are confined to the months of September and October. At other times there is plenty of water, and at all other points but those named the depth and also the width of the river are always ample. The trip from the entrance to the estuary to Rosario, requires about 48 to 60 hours in steamers, and about five days in sailing-vessels; although rarely a northerly wind prevails for a

number of days together, which delays upward-bound vessels.

Railway system.

The railway system of the interior has its starting-point here. The main feature of the system alluded to is that it is to consist of two lines to connect the Parana river at this point with the Pacific coast, furnishing points of departure for branch lines to every part of the interior of South America. The first of the transandine lines is to run through Cordoba, Tucuman, Catamarca, and thence across the Andes to Copiapo, and its sea-port. The second is to run through Rio Cuarto, Mercedes, San Luis, Mendoza, and thence across the Andes to Santiago de Chili, and so on to the Pacific at Valparaiso. The first is already completed to Cordoba, and nearly ready to Tucuman. The line from the mountains to the sea, through Copiapo, was completed some years ago. The second is already in operation to Rio Cuarto, and under construction to Mercedes. The west end of this line is also completed from Valparaiso to Santiago de Chili. Another line, independent of these two, is to run from this city northward through the agricultural colonies of this province to Santiago del Estero, to be continued to Oran, and thence to enter Bolivia. The contracts for this have been let and the first section commenced. All the future railways of the interior seem destined to connect themselves with these great lines. A general colonization scheme is to accompany this railway building, all under the direct management of the government.

Telegraphs.

There are now two lines of telegraph connecting Rosario with Buenos Ayres, one owned by a company, the other by the national government. The latter branches out from here to all parts of the interior; northerly to Paraguay and Brazil; northwesterly to Jujui, and the most remote provinces of the Argentine republic; westerly across the Andes to Valparaiso and other Chilian ports. The uniform charge for a telegram to any point of the republic is 25 cents.

Trade, (foreign.)

Direct foreign commerce at Rosario.

Imports and exports.	For 1870.	For 1871.	For 1872.
Imports	\$4, 661, 793	\$6, 541, 990	\$7, 189, 726
Exports	1, 402, 124	1, 841, 774	2, 756, 001
Total foreign commerce	6, 063, 917	8, 383, 764	9, 945, 727

Direct foreign navigation at Rosario.

Steamers and sailing-vessels.	For 1870.	For 1871.	For 1872.
Tonnage of steamers entered and cleared	27, 832	103, 490	159, 200
Tonnage of sailing-vessels entered and cleared..	51, 100	51, 534	71, 009
Total foreign navigation.....	78, 932	155, 024	230, 209
Proportion of steam tonnage to total, per cent ..	35	66	69

Although the tonnage of sailing-vessels is increasing, that of steamers is gaining on it rapidly. The vessels that are taking possession of the carrying-trade of this river are the iron screw-steamers. Not one of them carries the United States flag.

The commerce of Rosario with other ports of the republic in 1872 was \$3,629,531 imported, and \$2,868,750 exported. This trade was carried on in 1,372 entries with an aggregate tonnage of 111,797 tons, and 1,379 departures, aggregating 117,990 tons; being a total of 2,751 vessels and 229,787 tons of home or local trade of the port.

Home trade.

Summary of value of merchandise, and tonnage of vessels.

From—	Values.			Tonnage.		
	Imported.	Exported.	Total trade.	Entered.	Cleared.	Total navigation.
Argentine ports	\$3, 629, 531	\$2, 868, 756	\$6, 498, 287	111, 797	117, 990	229, 787
Foreign ports..	7, 189, 726	2, 756, 001	9, 945, 727	119, 548	110, 661	230, 209
Total	10, 819, 257	5, 624, 757	16, 444, 014	231, 345	228, 651	459, 996

The number of vessels flying the flag of the United States that entered this port during 1872 was 12, aggregating 3,361 tons, and the number that cleared was 11, aggregating 3,140 tons; and all of these were sailing-vessels.

United State flag.

The wooden sheds and mud huts of 1853 have given place to neat and even elegant houses. The city is well laid out, streets paved, and lit with gas, and traversed by a street-railroad; while churches, banks, hotels, theaters, and many vessels loading and discharging at the river-side, give evidence of its progress.

Remarks.

Coal and all other supplies may be obtained in abundance, and at prices comparing favorably with any port in South America. Repairs above the water-line may be executed; and there are facilities for heaving down.

Supplies.

BANKS AND SOUNDINGS.

Caution.

The navigator should not place reckless reliance on the form and dimensions of the banks of the Plata, as shown on the charts, and described in the following pages. These banks are undergoing constant modification by the currents and sea; some disappear entirely, others are formed; some preserve their general character, but from accumulations on one side, and washing away on the other, their position is changed from one side to the other of the channel. Several small banks lying close together have become united, and now form one extensive bank.

Bed of the estuary.

The bed of the estuary appears to be a rocky substance, covered with alternate layers of sand and mud. In some localities the rocks rise to the surface of the water and constitute the chief dangers in it.

Channels.

The two principal channels appear to have the same general depth of water at the present time that they had when the Spanish surveys were made, but their direction is very much changed. The bottom in the channels is of soft mud; on the banks it is of sand; around the edges of the banks it is a mixture of mud and sand. The pilots depend on the change in the bottom, more than the change of depth, for a warning when approaching danger. This seems to be an unerring guide to those familiar with the navigation.

Soundings.

The edge of the bank of soundings, and the lines of equal depth, between the parallels of $34^{\circ} 30'$ S. and $36^{\circ} 00'$ S., trend to NE. and SW., or nearly parallel to the general trend of the coast. The depth decreases with some regularity when the land is approached at right angles to these lines.

The depth of water between 75 and 90 miles from the land is 80 to 88 fathoms; between 60 and 75 miles it is 38 to 43 fathoms. It increases to the southward and eastward, and decreases to the northward and westward. Inside of the 40 fathom limit, the depth changes very irregularly, and the quality of the bottom becomes the best guide. The sea changes color about 70 miles beyond the limits of the estuary; the bluish tint gradually gives way to a yellowish green, and this to a muddy color as you approach the entrance.

Parallel of 34° S.

Between 85 and 90 miles from the land, on the parallel of 34° S., the depth is about 65 fathoms. The edge of the bank in this vicinity is steep to; but inside of this depth

the soundings decrease rapidly to 22 fathoms, at 50 miles from the land; and from thence the decrease is more gradual. The bottom is a mixture of sand, mud, and shells, where the depth is from 65 to 22 fathoms, but inside of the latter depth the mud disappears.

On the parallel of cape Castillo, $34^{\circ} 25'$ S., the depth is 55 to 60 fathoms, bottom of black mud, at 90 miles from the land; but the bottom changes from black mud to sand when approaching the coast on this parallel; and the depth decreases to 20 and 22 fathoms at 40 miles off shore. In the vicinity of cape Castillo, the lead will frequently bring up a few small red or pink broken shells; these are not found in any other locality, and therefore serve as a good mark for the cape.

On the parallel of cape Santa Maria the depth is 24 to 26 fathoms, bottom of fine sand and shells, at 60 miles from the land; it increases to 60 fathoms at 74 miles, and to 80 fathoms at 105 miles off shore. On this parallel, and to the northward, the bottom is sand, sometimes mixed with shells; to the southward it changes to very fine sand, sand and mud, and in some places mud and gravel.

On the parallel of Lobos island the bank of soundings extends about 120 miles off shore, where the depth is from 90 to 98 fathoms, bottom of sand and mud. When standing to the northward, on or near the meridian of $52^{\circ} 25'$ W., the depth will decrease to 58 or 60 fathoms, when the parallel of cape Santa Maria is reached; but in proceeding southward, on the same meridian, you will very soon run off the bank of soundings. After having obtained soundings on the parallel of Lobos island, in 90 to 96 fathoms, and made 50 miles to the westward, if the depth is 23 to 26 fathoms, bottom of muddy sand, the position is still on this parallel. Continuing the same course the depth will diminish, and the bottom gradually become more muddy.

On the parallel of English bank, or $35^{\circ} 11'$ S., after having crossed the Plata bank in 11 fathoms, the depth will increase to 17 and 20 fathoms until the meridian of Lobos island is reached. It will then decrease rapidly to 5 and 6 fathoms, sandy bottom, 15 miles eastward of the bank, on the meridian of $55^{\circ} 35'$ W.

When approaching the entrance on the parallel of $35^{\circ} 20'$ S., the depth will be 7 fathoms, bottom of sand, on the same

meridian, and will not increase to the westward of this meridian; but on the parallel of 36° S. it will increase to 10 and 11 fathoms, on the meridian of $56^{\circ} 20'$ W.

Between the parallels of $35^{\circ} 20'$ S. and that of cape San Antonio, the bottom is a mixture of sand, shells, and gravel. At 45 miles eastward of the cape the depth is only 15 fathoms; at the distance of 84 miles SE. of the cape it is 40 fathoms; and at 15 miles N. of the cape it is 6 to 7 fathoms.

La Plata bank. La Plata bank is a remarkable ridge of soundings, which trends nearly parallel to the coast, between Castillo cape and East point, at a distance of 42 to 46 miles from the land, and lies between the meridians of 53° and 55° W. In some places the bank is very narrow, and may be crossed between two casts of the lead taken in rapid succession; but the average breadth is about 5 miles. The depth of water on it varies between 10 and 14 fathoms, and the average depth is 11 fathoms; the bottom is sandy. The outer edge is steep-to, and there are a few places on the inner edge where the water shoals rapidly from 17 or 18 fathoms to 11 and 14 fathoms. The channel between the bank and coast varies between 30 and 40 miles in width, and 16 to 25 fathoms in depth; the bottom is soft mud in the middle; this gradually changes to sand as the edge of the bank is approached, and becomes entirely of sand when on the bank. At a distance of 6 to 9 miles from the coast the bottom is fine sand, mixed with gravel and shells. Approaching from seaward there is nothing to indicate the vicinity of the bank until the water shoals; but when standing off shore the edges are marked by a gradual change in the bottom from mud to sand.

The depth of water in the channel between Lobos island and the coast varies between 11 and 16 fathoms, muddy bottom. South of Lobos, as far as the parallel of $36^{\circ} 10'$ S., the bottom is very soft mud, and the depth of water is between 16 and 17 fathoms. When this parallel is reached it changes to a hard bottom, composed of coarse sand, mixed with broken shells, the depth remaining the same until the Plata bank is reached, where it decreases to 12 or 14 fathoms; bottom of fine sand and broken shells.

In order to keep north of the parallel of English bank, keep in a soft muddy bottom, standing to the northward as



the bottom changes to coarse sand. In proceeding up the estuary, toward Flores island, the depth will decrease gradually, but as long as you keep in the channel the bottom will be soft mud.

English bank is a dangerous rocky shoal, partially covered with sand, and dry at several places at low water, on which the sea continually breaks on a space 3 to 4 miles in extent. The northern breaker lies 11 miles S. 3° E. from Flores light, in latitude $35^{\circ} 09' 30''$ S., longitude $55^{\circ} 53'$ W. The southern breaker lies in latitude $35^{\circ} 13'$ S., and longitude $55^{\circ} 52'$ W. The space covered by the bank on which there is less than 3 fathoms depth is 12 miles in length and $7\frac{1}{2}$ miles extreme breadth. The muddy bottom becomes more and more mixed with sand as the bank is approached from any direction, and it changes to sand as soon as the edge is reached. In some places this change from soft mud to hard sand is abrupt; this occurs chiefly on the northern side. When near this edge of the bank the bottom will be fine, white sand, mixed with shells; near the southern edge the sand is fine, of grayish color, and often mixed with mud.

English bank.

The soundings eastward of the bank are very irregular, varying between 4 and 6 fathoms over a space 19 miles in length and 5 to 8 miles in width. There appears to be another bank in course of formation, which will be separated from English bank by a channel 4 to 5 miles in width and 7 to 8 fathoms in depth. This space has never been examined with care, and it is quite possible that shoaler and dangerous spots exist. The bottom on this shoal ground is mud and sand, while that eastward of it is sand and broken shells. There are 6 and 7 fathoms depth close to the north end of English bank, but a vessel south of this parallel will pass over the shoal water and uneven bottom east of the bank; therefore, if the lead be kept constantly in use, you will be warned of the danger by a subsequent increase of depth and more regular soundings. If obliged to anchor near the edge of the bank, it is advisable not to remain long in one position, for the bottom is so sticky and tough, in some places, that it is difficult to break out the anchors after they have been down some time.

A vessel with three masts, having her hull painted red, is moored in 7 fathoms, $2\frac{1}{2}$ miles NNE. of the north end of English bank, under the following bearings: Cerro light

Light-ship, latitude $35^{\circ} 06'$ S.; longitude $55^{\circ} 52'$ W.

NW. by W.; Flores island light, N. by W. $\frac{1}{4}$ W. A *fixed bright* light is exhibited at an elevation of 40 feet above the water, and is visible 10 miles in fine weather and a smooth sea; but when the vessel has much motion the light is lowered, and the average distance it is visible does not exceed 8 miles. During the day the vessel cannot be seen over 6 miles. Formerly there were a great many complaints about this light, but, owing to stringent orders which have been recently given to the keepers, the light is said to have become of some service to mariners. Soon after losing sight of Maldonado light, Flores island light is sighted first, if the vessel is in a favorable position for the channel; if not, the light of the light-ship will be seen first. When this occurs the course should be changed so as to pass east of it and bring Flores light in sight.

Bell-buoy.

A *bell-buoy*, painted red, $4\frac{1}{2}$ feet in height above the water, and visible from a distance of 3 miles, is moored in 28 feet depth, under the following bearings: English bank light-ship, NW. by N., distant 10 miles; eastern edge of the bank W. by S., distant $2\frac{1}{2}$ miles; northern end, NW. $\frac{1}{2}$ W., distant 9 miles; southern end, SW. by S., distant 7 miles. The buoy lies in latitude $35^{\circ} 14' S.$, longitude $55^{\circ} 46' W.$

Wrecks.

The channel between the north end of English bank and the rocks off Flores island is 10 miles in width, and clear of all danger. The English frigate Bombay was destroyed by fire in 1864, and the wreck sunk $6\frac{1}{2}$ miles S. of Flores island. In October, 1865, an English gunboat steamed over all parts of the wreck during a smooth sea, and low tide, and the least water found was $5\frac{1}{2}$ fathoms over the wreck, with 7 and $7\frac{1}{2}$ fathoms soft mud on either side of it. The bowsprit remained awash, secured to the wreck, for a considerable time afterward, but it finally broke adrift. In 1871 the pilots reported that the wreck had been driven northwestward by the heavy gale of October, 1869, and that the bowsprit was visible at extreme low water. The Spanish corvette Ceres was sent to search for it in 1872; 2,620 soundings were made without discovering any traces of it, and the least depth found was $6\frac{1}{2}$ fathoms. The commander is of the opinion that the lighter parts of the Bombay have been carried away by the sea, and the heavier parts have become embedded in the mud. It is prudent to pass close to Flores island, so as to avoid all risk.

The wreck of an iron vessel, recently sunk, lies under the following bearings : Flores island light, ENE. ; Cerro light, N. by W. $\frac{1}{2}$ W. ; Brava point, N. by E., distant $6\frac{1}{4}$ miles. The two lower masts remain attached to the wreck, one of which, having become unshipped, floats heel uppermost, and, projecting 10 or 12 feet above water, acts as a spar-buoy. The other mast remains stepped, and as its head is barely awash, forms a danger in mid-channel to be avoided in entering or leaving the estuary.

The Archimedes bank was discovered by an English frigate of this name, which struck on it. On examination, the bank was found to cover a space 6 miles in length, in a direction WNW. and ESE., and 5 miles in extreme width across the eastern end. The general depth of water over this space is 4 fathoms, bottom of sand ; but the center has a shoaler spot of less than 3 fathoms, bottom of very hard sand, and there is another of less than 8 feet on the SE. end. The last mentioned lies 24 miles S. $26^{\circ} 30'$ W. from the Cerro light, which is usually in plain sight from the deck when close to the shoal. The channel between this and English bank is 4 miles in width and 5 fathoms in depth, the bottom being composed of sand and mud. The approaches to this bank are indicated by a change from a muddy bottom to sand and mud, and finally to sand, as the edges are reached. The depth of water around the bank is not more than 1 fathom greater than it is over it, except in the shoalest parts.

There are several sand-banks southward of the English and Archimedes banks, the limits and extent of which are unknown. One of these, named Meduse, with only 16 feet of water over it, lies 18 miles W. by S. $\frac{1}{2}$ S. from the south end of English bank, in latitude $35^{\circ} 25'$ S., longitude $56^{\circ} 11'$ W.

The Narcisse bank is a cluster of shoals, on which the depth is three fathoms and less. These banks appear to be only the shoalest parts of an extensive flat, comprised between the parallels of $35^{\circ} 15'$ and $35^{\circ} 35'$ S., and the meridian of 56° and $56^{\circ} 15'$ W. The SE. edge of this flat is very steep in places ; the depth decreases suddenly from 9 fathoms to 4, $3\frac{1}{2}$, and 5 fathoms, and the bottom changes to very fine sand.

The Astrolabe bank is a long and narrow elevation of the bottom, terminating on the meridian of 56° W., in a dan-

gerous shoal, known as Rouen bank, with 15 feet over it at mean low water. The Astrolabe extends E. 14 miles from Rouen bank, on the parallel of $35^{\circ} 45'$ S.; its greatest width is three miles, the narrowest part being only a few hundred yards across. The general depth over the bank is $4\frac{1}{2}$ fathoms, with 8 to 10 fathoms all round the edges; within half a mile of Rouen bank, on which the sea nearly always breaks, there is a depth of 10 fathoms.

French bank.

The position of the French bank is not accurately known, although a great number of vessels have struck on it. This results from its small extent, and isolation on a very even surface, where there is an average depth of 9 to 10 fathoms. The position now adopted is latitude $35^{\circ} 43'$ S., longitude $55^{\circ} 37'$ W. It lies nearly in the middle of a line drawn through East point and San Antonio cape, and, fortunately, out of the route of all trading-vessels. In the early part of the present century, when vessels entered the estuary southward of English bank, the French shoal was the cause of much anxiety; notwithstanding this, no examination of it has ever been made, and the position is doubtful. The depth of water over a space 1 mile in extent is about 9 feet, the bottom of very hard sand; this is surrounded by depths of 10 and 11 fathoms.

Shoal.

There are two other shoal spots in this vicinity, which were discovered by Oyarvide when searching for French bank. One of these, in latitude $35^{\circ} 50'$ S., longitude $55^{\circ} 22'$ W., is about 2 miles in diameter, and has not less than 5 fathoms over the shoalest part, the bank being surrounded by a depth of 10 to 11 fathoms. The other, in latitude $35^{\circ} 49'$ S., longitude $56^{\circ} 04'$ W., is about the same size, and has similar depths over it and in its vicinity as those of the preceding. It will be observed that these shoals are nearly on the same parallel. Some writers have suggested that they are identical; this is very probable.

Ortiz bank.

Late English surveys go to show that our knowledge of the extent and depth of the Ortiz bank is very limited. It is impossible to give its dimensions, and equally impossible to state what is the depth of water on any line of bearing which crosses it. Fortunately, however, the western edge is comparatively well known; and the depth across the northern part is sufficiently well established to warrant its being crossed by vessels of 14 feet draught. The eastern

edge of the bank, if continuous at all, is a series of irregular pockets or *saccos*, extending westward, and in some places supposed to nearly intersect the bank by narrow, winding channels 18 feet in depth. The western edge is the shoalest. When standing toward the bank from the westward, the soundings will change in some places from 20 to 13 or 14 feet between two casts of the lead. The only guide by which dangerous depths may be avoided is the change in the nature of the bottom, from soft mud in the channel, to a mixture of sand and mud near the edges of the bank, and pure sand on the bank. Vessels of 12 feet draught frequently cross the Ortiz; but, as a rule, the pilots avoid it on account of dangerous patches of rocky bottom, which are supposed to exist in many places. It has been suggested, by those familiar with the navigation of the estuary, that the Ortiz is not a continuous plateau of shallow water, but a cluster of large and small banks separated by channels not less than 18 feet in depth. Some of the pilots pretend an acquaintance with such channels; one of them, they assert, is nearly on a direct line from Montevideo to Buenos Ayres.

The shoalest part is a narrow ridge of hard sand, lying between the parallels of $35^{\circ} 02'$ and $35^{\circ} 05'$ S., and the meridians of $57^{\circ} 05'$ and $57^{\circ} 09'$ W., 15 miles NE. by N. from Indio point, where there is a depth of 8 and 9 feet over a space 5 miles in length and 1 mile in width. The Ortiz bank is here only $2\frac{1}{2}$ miles in width; it trends to NW. by N. and SE. by S., and gradually deepens to the southward, terminating about 15 miles E. of Indio point. The bottom on the bank is sand, and rocks covered with sand. Along the edges there is a depth of 20 to 23 feet, bottom of muddy sand, and, as you draw away from the bank, it changes to soft mud. The edges are abrupt, and when crossing it from the eastward, at right angles to its direction, the soundings will decrease abruptly to 14 feet, and in places to 10 and 12 feet, except on the shoalest part, where there is not more than 8 feet over a hard, sandy bottom.

The Cuirassier bank lies nearly midway between the western edge of the Ortiz and the eastern edge of the bank bordering the southern coast. It is a plateau of sand and *tosca*, extending $3\frac{1}{2}$ miles SE. and NW. by three-quarters of a mile in width in the middle, tapering to the edges. The

Cuirassier bank.

depth of water over the bank is 16 and 17 feet, and around the edges it is 20 to 22 feet. The position is between the bearings NE. $\frac{1}{2}$ N. and NNE. from the tufted hill on Indio point; the southeast end is 11 miles, the northwest end 12 miles, from the same point. The former is half a mile, the latter 4 miles NW. of the light-ship.

Chico banks.

The Chico banks are a cluster of shoals of hard sand, about 8 miles in length in a NW. and SE. direction, and lying about midway between the western edge of the Ortiz and the eastern edge of the bank fringing the southern coast. The depths over the space comprised within the limits of this bank vary from 6 to 10 feet over the shoals, and from 17 to 20 feet between them. The shoalest spots are very steep to on the northeastern sides. From the northern extremity of the Chico banks Magdalena church bears S. $\frac{3}{4}$ E., distant 16 miles, and from the shoalest spot of 6 feet the same object bears S. by W. $\frac{1}{2}$ W., distant $9\frac{1}{2}$ miles.

Between the Chico banks and the coast of Buenos Ayres there is a channel about 4 miles in breadth, navigable for vessels of 15 feet draught by steering along the coast, but it cannot be recommended, as the currents run strongly, and, the nature of the bottom changing with the depth, the soundings are not a sufficient guide. The channel between the Chico and Ortiz has a depth of 4 to 6 fathoms, which is carried as far as Santiago point. From thence the decrease is gradual to $2\frac{1}{2}$ fathoms on the bar of Buenos Ayres.

Tides.

In the vicinity of the Chico and Cuirassier banks, during fine weather, the average semi-diurnal rise and fall of the tide is 4 feet. The current of the ebb sets to about SE., with an average rate of $1\frac{1}{4}$ miles an hour; that of the flood to NW., with an average of 1 mile an hour. The level of the water and the set of the current depend to such an extent on the force and direction of the wind that no dependence is to be placed on the tidal hours, or rise and fall, given by any authority. Winds from the NW. and SE. quarters create currents setting in the direction of the channel; those from NE. and SW. cause the currents to set toward the banks.

Coast bank.

The Coast bank, from cape San Antonio to Buenos Ayres, fringes the shore without a break, the distance it extends off varying from 3 to 12 miles. In San Borombon bay it is composed of soft mud and muddy sand; in the vicinity of

Piedras point it is hard mud and *tosca*; from abreast of Magdalena to Buenos Ayres it is sand, or sand and mud mixed.

The only remaining detached bank is a shoal of small extent, which lies in mid-channel between the Ortiz and coast banks, 11 miles SSW. of Colonio light-house, and in latitude $34^{\circ} 38' 45''$ S., longitude $57^{\circ} 56' 30''$ W. The least depth of water on this shoal is 10 feet; beyond this fact nothing is known. During the day the cathedral of Colonio is visible from the shoal, and during the night the light may be seen from aloft, if the weather is clear. This danger is said, by the pilots, to be an accumulation of sand around a wreck. Its small extent and isolation would indicate that this is the case. Danger

TIDES AND CURRENTS.

The tides of the Plata are very irregular, owing to the peculiar shape and the shallowness of the estuary, which enable the prevailing or approaching winds to overcome the natural effects of the tide-wave. The influence of the wind is so great that those familiar with the navigation are enabled to foretell approaching gales from close observation of the rise or fall of the waters and set of the currents. Sometimes during fine weather and light variable winds the waters of the estuary will rise or fall without any apparent cause, and at variance with the tidal laws. This is sometimes the result of the wind prevailing in the offing, or along the coast to the northward or southward; but more frequently it cannot be explained by any known laws or causes. It is generally uniform throughout the whole estuary. Causes.

The rates of the tidal currents rarely exceed 1 mile an hour with the flood, and $1\frac{1}{2}$ miles an hour with the ebb; but the currents produced by the winds often attain a rate of $3\frac{1}{2}$ to 4 miles an hour, the mean rate being $2\frac{1}{2}$ miles. Rate

The currents of the entrance generally follow the same laws as those inside. Off cape Santa Maria a set of 45 miles in 24 hours is commonly experienced, and as the sea is quickly raised by winds from the offing, while the set is always more or less toward the land, sailing-vessels should be kept a good distance off-shore when there are indications of a gale from the southeast.

Off Lobos island and Maldonado, just within the entrance, a current was experienced setting to the eastward, with the extraordinary rate of 5 knots an hour. A vessel was carried by the current, in one night, from abreast of Lobos to the northward of cape Castillo; and another, while in sight of Piedras point, experienced a current of 4 knots an hour, setting to SE. There is less current and more irregularity in the direction southward of English bank than there is along the northern shore.

It is probable that these strong currents are experienced only in the channels, and do not extend beyond the limits of the bank of soundings. It has been demonstrated by observation that the rate of the current is not the same at all depths as it is on the surface. Vessels of different draughts, following exactly the same route, have had advantages, one over the other, which could not have been the result of sail or steam power, and can be attributed to no other cause than that of strata of currents, setting with different rates in the same direction, or in opposite directions.

During the months of March, April, and May, the rivers discharge such an immense volume of water into the estuary that there is a sensible difference in the average level, and a slight increase in the currents setting out. At this time floating islets, named *camalotes* by the natives, are frequently met with in the estuary, and sometimes a short distance outside.

Ground-log.

It is impossible to give exact information as to the rate and direction of the currents produced by winds from every direction in the various localities; but there are certain general laws, which have been arrived at by different authorities, that will enable the navigator to guard against danger. There is, however, one unfailing method of ascertaining the exact set and rate of currents, which is accessible to all, in shallow waters, such as the Plata. Every competent seaman is familiar with the ground-log and its use; therefore it is only necessary here to impress them with the importance of using it frequently, twice an hour at least, while within the estuary, (and in the entrance wherever the depth of water will permit,) during the night, and in thick weather when no marks are visible.

Currents
caused by winds.

The pilots assert that gales from the northward, or winds from NW. round by N. to E., cause the waters to fall and

the current to set to SE. and S.; and that pamperos cause the waters to rise and the current to flow to NW., W., or SW., according to the direction of the channels.

Dupirier states that easterly winds produce a rise throughout the whole extent of the estuary; northerly winds cause the waters to fall on the northern coast and rise on the southern. Winds from W. to NW. cause a fall of the waters everywhere above the Ortiz bank; but below Colonio the waters fall on the southern coast and rise on the northern with these winds. The rate of the current, and the rise or fall of the waters, are always in proportion to the force and duration of the wind.

Winds from NNE. to NNW. cause the lowest water. The current produced by these winds flows out strongest along the southern coast, but it rarely exceeds three knots an hour; and on the northern coast it is inconsiderable.

Pamperos cause a rapid rise in Montevideo bay and along the adjoining coast, which lasts only during the first part of the gale, and is followed by a strong current setting to the southward round San José and Brava points.

When the wind remains for some time in the NE. quarter the current sets to the westward along the northern coast, while it is setting to the eastward along the southern coast, where the water is falling; and during the time the wind remains between SE. and NE. the current sets to the westward past Montevideo without increasing the depth of water below this point, while it fills up the river above the banks.

If the waters rise for a longer time than the flood should last during a calm or light winds from NW. to SW., it may be inferred that the wind will come out from NE. to SE., and probably already prevails from this quarter in the offing. When the current is observed to set to the westward along the northern shore of the estuary a northeasterly wind may be expected. The current sets into the entrance and the waters rise before approaching gales from the SE. and SW. in proportion to the force and duration of the wind. The difference of level produced by these winds has reached *twenty* feet on several occasions. An approaching SE. gale will cause a rise of the waters in the roads of Buenos Ayres; and this is often observed twenty-four hours before the wind arrives. In Montevideo bay the waters

Remarks.

will rise for many hours, and sometimes a whole day, before the pampero is felt.

Tides at Buenos Ayres.

The tides are more regular off Buenos Ayres than in any other part of the estuary. From a series of observations by Lieutenant Thoyon, French navy, it appears that the mean duration of the flood is 5^h 21^m; that of the ebb 7^h 5^m. The time of high water at new moon is 7^h 45^m, and of low water 2^h 45^m; the mean of the rise and fall is 9 $\frac{3}{4}$ feet. When the wind prevails between NE. and SE. the commencement of the flood and also of the ebb is in advance of the mean hour, and the flood lasts longer than usual. The flood also commences in advance when the wind is from NW. to SW., and the ebb when the wind is from N. to W. The latter is retarded by SW. winds, but the duration of the tide is about the same as usual. Regular tides occur with the wind from all directions, but most often when it is moderate between N. and E. The wind exercises a much greater influence on the rise and fall than it does on the hour of the tide. Winds from NE. to SE. facilitate the entrance of the tide-wave into the Plata, and cause a rise; those from NE. to SW., round by W., have the opposite effect. The difference of level rarely exceeds 3 $\frac{1}{2}$ feet; but a continuation of the wind from any quarter will occasionally produce extraordinary differences. From the 20th to the 27th of August, 1839, the level of the water rose from about 20 to 30 feet, with the wind from the eastward. Between the 29th and 31st of July, 1838, it fell from about 27 feet to 10 feet—the two dates giving a mean difference of 20 feet. It took six days with strong SE. winds to raise the water from 20 to 30 feet, and four days with strong westerly winds to cause it to fall from 27 feet to 10 feet.

Monthly observations have shown the smallest difference in level to be about 6 feet, the greatest 18 feet, and the mean difference about 9 feet. Several extraordinary falls of the river have taken place in consequence of heavy gales from NW. to SW. In 1792, a gale from the SW. for three days left the upper part of the Plata quite dry. Nearly the same thing occurred during the war of independence. The Spanish vessels blockading Buenos Ayres grounded in the bay, and were attacked by artillery hauled out on the city bank; but they were saved by a rapid rise of the waters, which returned so fast, that before the pieces could be got

on shore the water was above the horses' heads, and some of the guns had to be abandoned.

It is high water, full and change, in San Clemente anchorage at 10^h; the mean difference of level is $5\frac{1}{4}$ feet; the flood sets to NW., the ebb to SE. Tides in San Borombon bay.

At Rodeo anchorage, it is high water, full and change, at 10^h 45^m; the difference of level is 6 feet; the flood sets to N., the ebb to S. Off Piedras point it is high water, full and change, at 11^h 45^m; the difference of the level is 6 feet; the flood sets to NNE., the ebb to SSW.

From Paloma port to cape Santa Maria the tides are pretty regular, and the difference of level is about 5 feet. In Maldonado bay the greatest rise, in ordinary weather, is between 5 and 6 feet; the flood sets to SE. and the ebb to NW. When the wind prevails from the northward there is less water on this coast, while southerly winds produce a rise of 2 feet or more. The currents are irregular; they generally follow the direction of the wind, and sometimes they indicate from which quarter the wind may be expected. Tides of the north coast.

The current of the Uruguay united to that of the Parana acquires great strength, and runs with such rapidity in the vicinity of Martin Garcia island that the eastern channel has received the name of Infierno. This current is divided into two branches in the vicinity of the Hornos islands; that which follows along the northern coast is increased by the waters of the Rossario, Santa Lucia, and other rivers, especially after gales from the southward, which prevent their customary discharge. When it reaches Brava point and Flores island, strong and dangerous eddies are produced. The other branch runs along the southern coast with much less force, and gradually loses its identity. Current from the rivers.

WINDS AND CLIMATE.

One of the distinctive features of the climate of the Plata is the frequent and rapid changes of the weather. The general changes in the direction of the wind are in accordance with the law for the southern hemisphere—that is, from right to left, or from N. round by W., and S. to E. Winds.

During the summer months, from September to March, easterly winds prevail. The atmosphere is generally clear overhead, but thick and misty about the horizon. The prevailing wind in the offing is from NE., and as the estuary Summer.

Virazon.

is approached it changes gradually to the eastward. Within the estuary during this season a gentle breeze sets in from SE. between 11 a. m. and 1 p. m.; this gradually freshens and veers, being the strongest from E. to ENE. between 3 and 5 p. m. From this time it falls gradually lighter, and continues to veer, blows from the northward during the evening, and usually dies out about midnight, followed in the early morning by gentle airs from the westward, or calms, and flaws from all directions, which continue until the breeze again sets in from the SE. quarter during the forenoon. This wind is called the *virazon*. Whenever it fails, or light winds from N. and NW. continue up to sunrise, the weather becomes unsettled, and heavy squalls may be expected from the southwest. Sometimes the weather will continue fine for two or three days, but cloudy, rainy, and squally weather may be expected to follow a discontinuance of the *virazon*. Should the wind settle in the northward, a continuance of rainy, squally weather may be depended upon, and the longer this lasts, or the greater the fall of rain, the harder it will blow from the southward when the change occurs. The latter invariably clears the atmosphere, and ends up in a return of the *virazon*.

During the hottest months the NW. winds often blow very fresh between 9. a. m. and 2 p. m., and cause an oppressively hot, dry atmosphere, which is highly charged with electricity, and very injurious and unpleasant. These winds often continue for days, and are invariably followed by the summer pampero, or heavy SW. squalls of wind and rain, accompanied by thunder and lightning. The barometer continues to fall, while they last, in proportion to their strength. Winds from the southward bring cool and agreeable weather. There is, however, a marked difference between the southeast and southwest winds—the former are cool and damp, the latter are cool and dry, producing a refreshing atmosphere, and while they last the climate of the Plata can hardly be surpassed.

The pilots assert that the changes of the moon produce changes in the weather; experience and observation do not bear out their views, and here, as elsewhere, the influence of the moon on the weather is very questionable.

Gales from the southwest are of rare occurrence during this season. The roads of Buenos Ayres are worse during the summer months on account of the sea which is pro-

duced by the prevailing easterly winds. Communication with the shore is difficult during the day, and there is often considerable delay in loading and discharging cargoes.

This season is the best in Montevideo bay and roads, where the easterly winds do not produce much sea, or otherwise interfere with the communication between the vessels and the shore.

The following extract from the remark-book of a U. S. naval vessel on this station will serve to indicate the general character of the summer winds in Montevideo bay: "During the 76 days and 17 hours of our anchorage in this port, comprised between November 24, 1870, and February 28, 1871, the wind blew from the SE. quarter during 686 hours, from the NE. quarter during 469 hours, and from E. during 183 hours; making a total of 1,338 hours or (74) seventy-four per cent. of the time that the wind was from the eastward, and chiefly between SE. and NE. Of the remaining 503 hours, the wind was from the SW. quarter during 145 hours, from the NW. quarter during 120 hours, and from W. during 26 hours, making a total of 291 hours of westerly winds, which came chiefly from NNW. to SSW. The remaining 212 hours were divided as follows: the wind was from S. during 51 hours, N. during 79 hours, variable during 44 hours, and it was calm during 38 hours. This clearly indicates that the prevailing wind for December, January, and February is easterly, between NE. and SE. Whenever there was no unusual disturbance of the atmosphere, the breeze would set in about mid-day from SE.; gradually veering and freshening, it would reach a maximum between 3 and 5 p. m., from E. to ENE.; from this time to midnight it would gradually die out while hauling to the northward. Between midnight and sunrise it was not uncommon to have a gentle breeze from N. to NW., but this was not regular enough to be called a land-breeze or marked wind. It was also noticed that whenever these light northerly winds lasted up to sunrise, they were generally followed by a stiff breeze from NW. between 9 a. m. and 2 p. m., causing a hot, dry, and disagreeable atmosphere; this was usually followed by the summer pampero or strong SW. squall, which rarely lasted more than 4 hours, and was invariably presaged by a fall of the barometer while the NW. wind was blowing, and a rapid rise about 1 hour before the SW. wind arrived."

Winter.

During the winter, from March to September, the prevailing wind off the entrance to the Plata is from W. to SW.; within the estuary the wind prevails from the westward, but oftener from the northward of W. than from the southward. During this season, when the weather is fine, the wind veers round the compass as in summer; but northerly winds bring drizzling rains, lightning, and thunder. Southerly winds bring hail, when they first commence; and easterly winds are accompanied by an abundance of rain.

Whenever the wind veers in accordance with the law for the southern hemisphere, fine weather may be expected; but when it backs round, disagreeable weather and strong winds may be expected. Southerly winds in winter blow in squalls which are lasting, but not as violent as the summer squalls from this direction, although these are of short duration. The winter is the best season in the roads of Buenos Ayres; then the prevailing westerly winds blow from the land and the sea is generally smooth enough for easy communication. Squalls from the southwest or pamperos prevail from June to October; during this season the winds are variable, and calms, squalls, and rain are most frequent. When an easterly wind is accompanied with squalls it is generally followed by a westerly wind with squalls, and *vice versa*. The weather generally remains unsettled until the wind veers in accordance with the general law.

Pamperos.

The bad weather of the Plata sets in with the wind from SW. or SE. All winds from the southwest are called pamperos, from their blowing over the *pampas* before reaching the coast. They may be divided into two classes, the general and the local pampero. The local pampero is of short duration, and when the wind blows fresh the atmosphere is generally clear. The general pampero is accompanied with rain and squalls; it originates in the Cordilleras, passes over the *pampas*, generally lasts from two to five days, and is named *pampero sucio* by the natives.

Pamperos generally commence with a squall from the westward, which advances in a heavy, dark mass of clouds; other squalls, accompanied with rain, hail, and thunder, generally follow the first, but the sky soon becomes clear, the atmosphere cool, the wind veers to SW. or SSW., and blows a steady fresh breeze. Sometimes the squalls are very violent, but as a rule they are no more to be dreaded than

squalls in general. It is asserted that pamperos do not blow with as much violence at the present time as formerly. This statement is absurd, and arises from the well-known disposition to exaggerate danger that was shown by nearly all the early navigators frequenting the coast of South America.

Pamperos are met with between 30° S. and 50° S., but they are not as distinctly marked outside of the estuary as they are within it and in the offing between cape Santa Maria and cape San Antonio. Within these limits the following indications, either combined or separate, serve to mark their approach :

An interruption of the regular diurnal breezes ; a continuation of northerly winds accompanied with oppressive heat ; fresh NE. winds, followed by unsettled weather, then by a N. wind, which freshens and hauls to NW., accompanied with haze or light rains. Should the horizon be cloudy, with lightning in the southwest, a pampero is almost certain to follow. A steady fall of the barometer, sometimes for several hours, and even days, before they arrive ; a rise of the waters of the estuary ; the presence of large numbers of insects, and a fine white filament in the air ; and the extreme clearness of the atmosphere, which admits of objects being seen a long distance. Violent gusts of wind have been known to precede a pampero without any of the above indications of its approach ; but these are of very rare occurrence.

Indications.

As soon as the pampero commences, the atmosphere becomes cool. It lasts from 2 to 10 hours in summer and 2 to 5 days in winter. Pamperos are less frequent but more violent in summer. During the winter the wind often hauls to S. and SE. and continues to blow in squalls, accompanied with rain and mist. When the pampero commences with a clear sky it lasts longer than when it commences with rain and cloudy weather. If, after the pampero has commenced, the rain continues and the wind veers to S. and SE., it will last a long time, and the weather will not become fine until the wind again veers to the westward. This change is sometimes accompanied with violent squalls of wind and rain, similar to those with which the pampero usually commences. The end of a pampero is usually presaged by a lull about sunset or sunrise. If the wind freshens again, it usually indicates a change to another quarter, but generally

the end follows after a lull; the wind hauls to the westward, the sky clears and there is a return of the regular breezes. There is usually a heavy gale about the end of August in the Plata; within the last ten years there have been more wrecks about this time than at any other.

SE¹ gales.

The gales from SE. are the most dangerous in the Plata, because they blow directly on the northern coast, and are usually accompanied by rain and thick weather; besides this, they produce dangerous currents and a very high sea. These gales are presaged by a high and rising barometer, thick atmosphere, incessant lightning, a red sky at sunrise, a rise of the waters, and very often by a rapid current, which is strongest beyond the Ortiz bank. Vessels in the estuary caught in one of these gales, and unable to reach a port, should anchor, if possible, to leeward of some bank, but at all events on a mud-bottom, and far enough to windward of any danger to permit of dragging. If you are outside of the estuary, the vessel will be set rapidly toward cape Castillo, where you may find shelter on the northern side of the cape; otherwise you should stand off shore, for it is these winds which have caused nearly all of the wrecks off the entrance to the Plata.

Barometer.

The barometer usually indicates the changes of weather. Here, as elsewhere, it is the rise and fall of the mercury, and not the actual height, which must be noted, for the oscillations are similar with winds from a different direction. The general rule is that the barometer rises with easterly and falls with westerly winds; but with winds from any direction it falls when the weather is squally.

The annual range of the barometer is from 30.6 inches to 29.3 inches. The maximum is reached in August or September. The minimum varies from January to June.

When the weather is fine and settled, the mercury falls a little before the easterly winds set in; and as soon as they are settled it rises again, and continues to rise slowly until the wind veers to the westward, when there is another slight depression if the wind is to return to the eastward. Stormy and unsettled weather will cause a fall of the mercury. If the wind is from NE. to SE., it will rise as soon as the weather becomes settled, and continue to rise while these winds last; but if the barometer continues to fall and

the horizon is cloudy, with lightning in the SW., a pampero may be expected.

The fall of the barometer which precedes bad weather is more gradual than the rise when the weather becomes settled. The diurnal oscillation is well marked during continuous fine weather. The maximum height is reached at sunrise; it commences to fall about 9 a. m. The minimum is reached between 12^h and 4^h p. m., and the rise commences again at sunset. The height of the barometer is generally in inverse ratio to the temperature; the greatest height occurs with southerly winds, the minimum with winds from the northward. The mean of the former is 30.5 inches, the mean of the latter is 29.5 inches.

The mean annual temperature of the Plata is about 64° F.; but the changes are often very rapid. The thermometer has been known to rise from 60° F. at 9^h a. m. to 90° F. by 3^h p. m., and fall from 96° F. at noon to 54° F. at midnight. The lowest temperature of the Plata recorded in the log of the U. S. S. Portsmouth, during a cruise of three years on this station, is 37° F., the highest 103° F. The climate is healthy, and these extremes of heat and cold are not of frequent occurrence. As a rule the extremes are 32° to 88° F., the former occurring in July, the latter in February. The hottest weather occurs when the dry northerly winds blow, the coolest when the wind comes out from the southward and blows fresh with a clear sky. Frost is of very rare occurrence, and snow is unknown. The mean temperature of Buenos Ayres is 2° to 3° higher than that of Montevideo.

Thermometer.

Thick fogs are of frequent occurrence during the months of July, August, and September. They are more dense between the entrance and the Ortiz bank than in the head of the estuary. At Buenos Ayres they seldom last more than two or three hours.

Fog and haze.

Rain falls in all seasons, but the greatest rain-fall is in May and October, and it is more frequent during the night than by day. The distribution of rain is unequal, and the several provinces of the Plata often suffer very much for want of it and by having too much at a time.

Rain.

The following is the mean per year from observations covering 15 years: 74 days of continuous rain; 36 days of squally weather, with rain; 135 days of clear sky, and 120 days of unsettled weather.

Dews

As the difference between the temperature of day and night is generally very considerable, the vapor dissolved during the day is condensed during the night and precipitated in dew, sometimes not unlike a drizzling rain in its effects.

Thunder and lightning.

Thunder and lightning, particularly the latter, are of very frequent occurrence, but the damage resulting from lightning is not in proportion to its frequency and vividness.

Mirage

There is a great deal of refraction in the Plata, and still more in its tributaries; objects above the visible horizon disappear, and are replaced by others below it. In this way the cerros of San Juan, distant about 36 miles from Buenos Ayres, are frequently seen from this city, although only between 430 and 450 feet in height. This only occurs during a very clear atmosphere, and it is an indication of approaching bad weather. This extraordinary refraction not only takes place near the horizon, but also many degrees above it. Captain Mouchez gives an instance of a fog rising during the time he was taking observations, which hid the sun but slightly, leaving the limbs clearly visible. In calculating the hour angles and comparing the different series, it was found that the refraction regularly increased with the fog, and that at the last observation, when the altitude was 31° , it was higher by $1' 25''$ than that given by the tables.

NAVIGATION OF THE ESTUARY.

Land-fall.

The land-fall for entering the Plata does not present as great difficulties as is generally supposed, provided the mariner takes advantage of every opportunity for obtaining the latitude, makes continuous and frequent soundings, and, combining the two, proceeds on his course with prudence, but with confidence and decision. Very many shipwrecks have occurred near the entrance from neglecting to take every advantage of opportunities of ascertaining the latitude during night and day. The weather changes suddenly, and often, without warning, a cloudless sky and horizon will become obscured, when no observations can be made.

During NE. winds the best land-fall is cape Castillo; during S. or SE. winds the parallel of Lobos is the best on which to approach the entrance. If you are set to the southward by a continuation of NE. gales and a northerly

current, and the latitude can be obtained with any degree of accuracy, the entrance may be approached to the southward of English bank; but this should be avoided whenever it is possible to gain the northern channel. Approaching on the parallel of Lobos, the first soundings will be about 90 to 95 fathoms on the meridian of $52^{\circ} 25' W.$; from thence steer to the westward, so as to pass about 30 miles southward of cape Santa Maria, where the depth will have decreased to between 18 and 20 fathoms. The Plata bank will have been crossed, and the changes of depth and the character of the bottom will have indicated the position before you have reached this meridian. Allowance must always be made for a current, whatever the direction of the wind, and particularly when it is blowing from the SE., for then there is always a current setting directly toward the coast. If the vessel has been set to the southward, the depth will decrease slowly and the bottom will be fine gray sand until you reach the meridian of Castillo, where it will become mixed with black sand. If the vessel is set to the northward, the bottom will change to sand and broken shells, and the depth decrease rapidly. As long as you remain on the parallel of Lobos, the depth will decrease gradually and regularly, and the bottom will change to mud and sand. Muddy bottom is a sure indication of being in the fair-way to the channels.

Many navigators who are ignorant of the existence of the Plata bank, finding the depth change suddenly to 10 or 12 fathoms, believe themselves too near the land and stand off shore; this is often the cause of great delay, and sometimes disaster. If the position of the vessel is uncertain and this change occurs, you should steer NW., sounding as rapidly as possible. If you are on the bank, the depth will increase rapidly to 13, 16, and 20 fathoms, and the lead will indicate a change in the bottom to sand and mud, sometimes pure mud, as soon as the fair-way is reached. In this case the course should again be changed to the westward, so as to keep over a muddy bottom. If the depth continues to decrease while steering NW., it is an indication of being too near to the coast or to English bank, and no time is to be lost in standing off shore. There are many localities where the depth increases abruptly; these are known to the coasters as *posos*, and should give no uneasiness to the mariner.

The quality of the bottom will be found the best guide in such cases. Whenever the position is uncertain and stormy weather is approaching, select an anchorage and remain in it until there is a favorable change.

From Lobos to Flores.

During clear weather the land and lights will enable you to follow the channels without further directions; but during thick weather the land becomes the only guide, and the following observations may be found serviceable. Having passed Lobos island, steer for the middle of the channel between Flores island and English bank, sounding rapidly and hauling to the northward or southward as the bottom changes to sandy mud or the mud becomes hard; the former indicates an approach to English bank, the latter an approach to the northern coast. Abreast of Negra point the depth in mid-channel is 12 fathoms; between Flores and English bank it is 7 to 8 fathoms. Shells mixed with the mud is an indication of being too near to Flores, and the greater the proportion of shells the nearer you are to the island. In proceeding to the westward, the water will shoal gradually and the bottom will remain soft mud as long as you keep in the channel. Many instances are recorded of vessels having reached the anchorage off Montevideo without having seen the land or lights; but as a rule, a vessel caught in thick and threatening weather, when the position is doubtful, should be anchored to await a favorable change.

The safe limits of the boards for vessels beating up from Lobos to Flores are the parallels of point Negra for the northern and sandy bottom for the southern. The deepest water is where the mud is softest, which is nearly in the middle of the channel. The depth decreases very irregularly when standing toward the outlying shoals of English bank, but the bottom always changes to muddy sand, sand, and sometimes mud, sand, and gravel. Stiff muddy bottom is found north of the parallel of Flores when approaching it from the eastward. The channel northward of Flores should be avoided during thick weather.

There is no danger to be feared between Flores and Montevideo, south of the parallel of Flores, until you reach the edge of Archimedes bank, where the soundings give ample warning. Brava point should not be approached nearer than 1 mile, where the depth is $4\frac{1}{2}$ fathoms.

The light-ships intended to mark the Panela rocks and Chico and Indio banks are of great assistance in proceeding ^{From Montevideo to Buenos Ayres.} to Buenos Ayres. The mariner is warned that these vessels sometimes break adrift and frequently drag their anchors. Until recently the lights exhibited from them were so badly attended to that they frequently went out, and when they were burning could easily be mistaken for the lights of vessels at anchor. Efforts have been made to remedy these faults, and recent reports indicate a change for the better. Vessels of over 15 feet draught should be in charge of a pilot under all circumstances; those of less draught may be navigated by the master during fine weather or with a fair wind. With some exceptions the pilots are unreliable and need watching; the master should quietly and unoffensively observe every change of the course and in the soundings, obtain a new departure whenever possible, and be ready to resume charge of the vessel should such a step be necessary.

The north channel is seldom used by any but coasters and river-craft, and is not suitable for vessels drawing more than 14 feet. Assuming 15 feet depth of water at ordinary stages to be the limit beyond which no vessel navigating this channel may pass, the route to be followed by steamers and sailing-vessels with a fair wind is as follows: Stand out of Montevideo bay until the cathedral steeple bears E. by N.; then change the course to W. by S., keeping the cathedral on the opposite bearing until the Panela light-ship is seen. If the current has been correctly estimated the light-ship will bear W. by N., distant 5 miles. From this position steer WNW. for 34 miles, or until the extremity of Jesus Maria point bears NE. This course leads across the tail of the Santa Lucia flat, in not less than 17 feet, one mile southward of the supposed position of Gregorio bank, and the same distance from the spit which makes out to the eastward from the bank fronting Jesus Maria point. When the extremity of Santa Maria point bears NNE., and the depth is less than 4 fathoms, it indicates that the position is either to the northward or southward of the route recommended. In the latter case the land will appear distant, and the bottom will be very soft mud; in the former the mud will be sticky, and the land will appear near. Vessels drawing more than 8 feet should immediately change the course to SSW.,

North channel.

until the water deepens to 4 fathoms, so as to avoid entering the *cul de sac* formed by the spit and the bank. When the sandy point of Jesus Maria bears NE., distant $3\frac{1}{2}$ miles, the depth at mean low water is 4 fathoms. From this position the course should be changed to NW. $\frac{1}{2}$ N. for $18\frac{1}{2}$ miles, or until the summit of the remarkable flat down west of the entrance to the Cufre river bears NNE. Along this course the depth will remain above 20 feet until you are abreast of the entrance to the Pavon, when it will shoal from 22 feet to 17, 16, 15, and finally to 14 feet during low water. The shoalest part of the north channel is comprised between the Pavon and Rossario rivers. If the tide is low, vessels drawing 14 feet should be anchored off Pavon point to await a rise before proceeding farther. From the position off the Cufre the course is W. for 13 miles, or until Sauce point bears N. The depth will increase 2 or 3 feet when abreast of Rossario point, and continue above 16 feet during the remaining part of this route. When abreast of Sauce point change the course to W. by S. for $12\frac{1}{2}$ miles, or until the Colonia light-house is sighted and brought to bear W. by N. $\frac{1}{4}$ N. when distant $8\frac{1}{2}$ miles. The position will then be 2 miles S. of the Pipas rocks, and the course may be changed to W. by N. $\frac{1}{4}$ N. for the light-house of Colonia.

Beating.

The distance from Montevideo to Colonia by this route is 92 miles. The courses given lead in sight of the land during the whole time, and the mariner should be able to verify the position by bearings of the prominent objects. Sailing-vessels beating through the channel should endeavor to keep the land in sight, and when standing toward the coast attention should be given to the change of bottom from mud to sand. The latter indicates a near approach to dangerous depths. The limits of the northern board between Espinillo point and the western edge of the Santa Lucia bank is with the summit of the cerro of Montevideo bearing E. by S. The southern edge of the Jesus Maria spit is very steep, the depth changing abruptly from $4\frac{1}{2}$ and 5 fathoms to 10 feet. In this vicinity there is no good mark for the limit of the northern board, for the soundings are very irregular, varying from 22 to 30 feet between two casts of the lead. But the space comprised between the 18-foot limit to the westward and the 24-foot limit to the eastward is at least 8 miles in width; therefore it would be prudent, when standing

to the eastward, to tack when the water deepens to 4 fathoms, and, when standing westward, to tack when it shoals to 18 feet, until you weather Jesus Maria point. The soundings are for mean low water, and allowance should be made for the state of the tide. Having cleared the spit, the safe limit of each board for vessels drawing 14 feet is when the depth decreases to 18 feet, until you are abreast of Pavon point. There are two exceptions to this rule. One is when standing in toward the highest part of the intervening coast, where, in a space of 1 mile, the depth decreases abruptly from 22 to 11 and 12 feet; the other is when standing in for Pavon point and the coast northward as far as the river, where the decrease is very abrupt, from 22 to 3 feet in the distance of three-quarters of a mile.

Between the Pavon river and Pipas rocks the quality of the bottom does not afford any indication of an approach to dangerous depths. This place appears to be composed of a mixture of mud and sand, but westward of Rossario point the former predominates, while the soundings are above 14 feet. The space for beating between the Rio Cufre and Colonia averages 3 miles in breadth. The limit of the southern board is when the water shoals to 14 feet; the limit of the northern board varies. When standing in toward the Cufre river and the high land to the westward, tack when the water shoals to 14 feet. When standing in toward Rossario point, go in stays promptly as soon as the water deepens to 18 or 19 feet, for the bank is steep-to. Abreast of Sauce point, do not stand to the northward in less than 16 feet depth; abreast of Artilleria point there is a space of deeper water, and the safe limit for the northern board is 18 feet. The Pipas rocks are very dangerous when the tide is high, and it is advisable to stand well to the southward. When approaching them the safe limit of the northern board is with Artilleria point bearing E. by N. $\frac{1}{2}$ N., or with Colonia light-house bearing W. by N. Having cleared these, stand in toward the coast. The channel for vessels drawing 14 feet becomes only 1 mile in width between the northern edge of Fisher's bank and the coast, but in this space there are many objects which are readily recognized, and the position is easily ascertained.

It would be prudent for vessels beating through the north channel without a pilot to be anchored during the night.

Middle channel.

The Middle channel is suitable only for vessels of 10 feet draught, and is the most direct route between Montevideo and Buenos Ayres. This route consists in making a N. 80° W. course from the Panela light-ship to the guard-ship of Buenos Ayres. The distance is 106 miles. This course leads across the Ortiz bank, passes within sight of the Chico light-ship $1\frac{1}{2}$ miles beyond the range of the Colonia light, and close to the dangerous isolated shoal or wreck between Colonia and Lara points. The soundings will decrease gradually from 24 to 12 feet. The latter, the least depth known to exist on this line of bearing, is found when you are on the meridian of the Chico light-ship. From this position the water will deepen to more than 3 fathoms, until the flat of Buenos Ayres is reached.

South channel.

The South channel is nowhere less than 19 feet in depth at mean low water, until the flats of Buenos Ayres are reached, or until the Guard-ship bears W. distant 5 miles. Vessels drawing over 16 feet should stand to the westward from Montevideo roads until the Cerro light bears NE. $\frac{3}{4}$ E. and the Panela light-ship NW. by W. $\frac{1}{2}$ W. In this position the depth will be 28 feet at mean low-water. Taking a departure from this point, the course to be made good is SW. $\frac{3}{4}$ W. for 36 miles, when the Indio light-ship will bear NW. $\frac{1}{2}$ N., distant 15 miles. The Cerro light, or the mount itself, will remain in sight at least 17 miles from the point of departure, if the weather is clear; and so long as it remains in sight, the route should be modified so as to keep it on a NE. $\frac{3}{4}$ E. bearing. The depth will decrease gradually from 28 feet to 19 or 20 feet, with the Cerro light bearing NE. $\frac{3}{4}$ E., distant 25 miles; thence to the end of this course the depth at mean low-water should vary between 19 and 21 feet. There is no mark for ascertaining when the distance has been made, except a change in the nature of bottom from mud to ooze; but if the weather is clear, Piedras point should be seen from aloft, bearing SW., distant $9\frac{1}{2}$ miles; at all events, it should be seen before the soundings decrease below 18 feet. Should the depth decrease to 18 feet before the land or the light-ship is sighted, the course should be changed at once to the northward of W. to sight the latter. It should be borne in mind that the currents generally set diagonally across the route to be followed up to this point. So long as the Cerro remains in sight, it affords

an excellent guide for ascertaining their general direction. When lost sight of, the following may serve to indicate whether or not the prescribed route has been followed: Should the depth increase to 23 or 24 feet, and remain about the same for a space of 8 or 10 miles, and then shoal to 21 or 19 feet, it is an indication of having been set to the northward, and Indio point light-ship will be sighted bearing to the southward of W. Should the depth continue to increase above 24 feet, and the bottom become mud and sand or mud and ooze sooner than expected, it is an indication of having been set to the southward; and if the same course is held, the water will shoal to less than 18 feet, and the bottom become a mixture of mud and *tosca* before any land is seen.

Vessels drawing 16 feet may steer direct for Indio point light-ship, making good a W. by S. $\frac{3}{8}$ S. course for a distance of 40 miles from the point of departure. On this route the Cerro light should bear ENE. when lost sight of, distant 25 miles; and Indio light-ship will be sighted before reaching the tail of the Ortiz bank, which will be crossed in not less than 17 feet at mean low water. The light-ship should not be brought to bear to the southward of W. when approaching it from the eastward; and it would be well to pass close to the eastward of it, so as to obtain a new point of departure for the channel above.

The course to be made good from a position about a mile NE. of the Indio light-ship is NW. for a distance of 30 miles. During the day the church and village of Magdalena will be sighted from aloft about the time that Indio light-ship is lost sight of. These objects will remain in sight until the Chico light-ship is seen. With these two marks in sight there should be no difficulty in keeping clear of the Chico bank. The depth of water will increase gradually from 21 feet when abreast of the Indio light-ship to 36 feet when Chico light-ship bears W. distant 3 miles. In this space the current generally sets parallel to the direction of the channel during ordinary winds and weather; but in exceptional cases it will be found setting diagonally across the channel.

When the Chico light-ship bears about S. by W., distant $2\frac{1}{2}$ miles, change the course to W. by N. $\frac{1}{2}$ N. Having run about 35 miles, the guard-ship of Buenos Ayres should be

sighted bearing about W. and distant 5 miles. This course leads 2 miles southward of the shoal in mid-channel, and, should the weather be thick, it would be prudent to favor the south side of the channel, so as to be certain of avoiding it. As Buenos Ayres is approached, the southern coast will be sighted, and the various landmarks will serve as guides during the remainder of the route. From the position 5 miles E. of the guard-ship, vessels drawing 16 feet may cross the bar by steering for her. The distance from Montevideo to Buenos Ayres roads, by this route, is about 130 miles.

Beating through
the South chan-
nel.

The foregoing directions appear to be sufficient for steamers and sailing-vessels, with a fair wind, during fine weather, when the lights and other marks can be seen; but for those obliged to beat up or down the South channel, and such as may feel that it is necessary for them to keep under way in thick weather, the following general remarks may be of some service: First, secure a good pilot, and watch him well; make every arrangement for frequent and continuous soundings; examine the quality of the bottom at every cast when the position is doubtful; use the ground-log every half hour; observe by it the set of the current, and compare the courses and distances made by the common log, with those shown by the ground-log; prefer the delay caused by anchoring to the risk of losing the vessel; carry enough sail to secure prompt handling, and avoid having to take in the light sails at a time when the crew should be otherwise employed. Ordinarily it is a waste of time and labor for a sailing-vessel to attempt to beat against a wind to which she cannot carry top-gallant sails, for the current produced by such a wind is usually more than any vessel can work against.

The limit of the boards while the Cerro remains in sight are: for the eastern the summit bearing N., and for the western, ENE. When lost sight of, it is prudent not to stand to the eastward beyond the depth of 30 feet or to the westward below that of 20 feet; and as point Piedras is neared shorten the boards to the northward, but prolong them to the southward of the direct course. As long as the light-ship remains in sight the limits of the boards are indicated by its bearing. Having lost sight of it, if the weather is clear, it would be better to stand to the southward and

sight the church and village of Magdalena, so as to get a new departure before coming up with the Chico bank. With the church in sight, the soundings must be the guide, for the depth decreases gradually near the edges of the Ortiz and coast banks, and the lead will indicate a change of bottom as they are neared. Having brought the church to bear SW. $\frac{1}{2}$ W., the southern board must be shortened; and it would be prudent not to stand to the southward below a depth of 24 feet. A good mark for going in stays when standing to the northward in clear weather is when the church is lost sight of from the rigging below the tops. With the Chico light-ship in sight, the limits of the boards are indicated by her bearing. When she is lost sight of, the lead must be depended on; and the boards may be prolonged to the edges of the banks, except in the vicinity of the shoal in mid-channel, where it would be prudent to beat along the edge of the Ortiz bank until the cathedral of Colonia is sighted and a new departure made. When standing in for the roads of Buenos Ayres, look out for the wrecks which are very numerous in this locality.

In addition to the depth of water, the quality of the bottom will be found a good guide for the edges of the channel, for it invariably changes from soft mud to mud and sand, and subsequently to sand.

Vessels bound to Colonia follow the same route through the South channel until they are abreast of Santiago bank. From thence they should follow the edge of the Ortiz bank until Colonia cathedral or light is sighted.

To Colonia

The edge of the Palmas flat shelves very gradually. The course to be made good from the roads of Buenos Ayres to the fair-way buoy will depend on the state of the tide and draught of the vessel. Ordinarily a vessel drawing 12 feet may steer NE. $\frac{3}{4}$ N. direct from the guard-ship to the buoy, but those of greater draught must make a more circuitous route.

To the rivers.

A good pilot is absolutely necessary for vessels drawing over 8 feet; and it would be a saving of time, often of disaster, if all foreign traders took pilots. They are, however, not to be relied on absolutely, for they frequently lose their wits at the most critical moments. They also habitually stand across the channel in order to find the edge. This should be positively forbidden; as the current is usually strong, and a heavy or long vessel will shoot across and

Pilots.

ground before the course can be changed. The master should, therefore, personally superintend the movements of his vessel, and be ever ready to resume control and anchor.

Landmarks.

The cerros of San Juan, the cathedral at Colonia, and the other landmarks, will enable you to plot the position frequently and ascertain the set of the current. When approaching the fair-way buoy be careful to avoid the bank close to the southward of it, over which there is only 10 feet depth. Should it be necessary for a vessel-of-war of heavy draught to ascend above Martin Garcia, it would be advisable to send boats ahead to mark the channels. With steam cutters this would cause but little delay.

Martin Garcia channel.

Vessels bound to the rivers direct should steer so as to pass within 2 miles of Farallon islet. From thence steer N. by W. $\frac{1}{4}$ W. until Colonia cathedral is in line with the western Hornos island (one-third of its length from the western end,) bearing SE. $\frac{1}{2}$ E.; then proceed on this line of bearing, which will lead to the fair-way buoy. Passing it on the port hand, continue on the same course, NW. $\frac{1}{2}$ W., until the northern end of the summit of a remarkable white sand-hill comes in line with the northern summit of the cerros of San Juan, bearing NE. by E. $\frac{1}{4}$ E. Then steer for Chico point until the mast and white beacon on Martin Garcia island are in line, bearing NW. $\frac{3}{4}$ W. Keeping these objects in line will lead to the northward of the middle bank and southward of the flats making out from the island. It is difficult to distinguish the Hornos island or Colonia from the fair-way buoy; and the lead and beacons become the only guides. If no beacons are seen, anchor.

The channel between the middle bank and the tail of the flat extending from Martin Garcia should, if necessary, be buoyed, as it is only about three-quarters of a cable in breadth, and has frequently only 16 feet depth. When there is a depth of 16 feet in the middle bank channel, there will be only 13 feet over the flats, which commence about 15 miles below Martin Garcia; and when the rocks situated on the western side of Martin Garcia are awash, vessels bound down may be certain of 13 feet all through the passage. Having passed through the middle bank channel, steer so as to pass about 2 cables from the southern end of Martin Garcia. The edges of the banks are generally marked by a ripple.

Having passed Martin Garcia, steer about NW. by W. $\frac{3}{4}$ W., for the beacons marking the shoal extending northward from the island. Follow the shoal around by the lead, and haul up the main channel, with the high bluffs of Punta Gorda just open of Juncal island, until you are abreast of Los dos Hermanos islands and bank. The highland of Punta Gorda should then be brought over Juncal island until the Boca Guazú is well open, or the village of Las Vacas on the Banda Oriental shore bears SE. by E. $\frac{1}{4}$ E. The rise and fall of the waters in this locality is much the same as it is in the Plata. A vessel at anchor lies head up stream. The highest tide abreast of the Hornos islands is said to occur about an hour after the setting of the moon.

The Infierno channel requires a pilot, and no directions for it could be made intelligible. To cross from a berth in mid-channel of the Infierno into that above Martin Garcia, bring the Carretas rock southward of Martin Chico point, and the southern summit of the cerros San Juan in line bearing E. $\frac{1}{2}$ S., and then steer NW. by W. for about $1\frac{1}{2}$ miles until Martin Chico point comes in line with the southern summit of the cerros San Juan, bearing E. by S.; then steer W. by N., keeping them on the opposite bearing until the high wooded bluff of Punta Gorda is just open of Juncal island. Steer up the channel with this mark on until you are abreast of Los dos Hermanos. Punta Gorda should then be brought over Juncal island until the Boca Guazú is open.

The Carretas rock lies $3\frac{1}{4}$ miles E. of Martin Garcia island and about 1 mile southward of Martin Chico point. It is 8 feet out of water at ordinary high tides, stands close to the northern edge of the channel, and makes a good beacon.

The height of the tide depends upon the force and direction of the wind. With fresh easterly and southeast winds there will be a rise of 5 or 6 feet above ordinary high-water level, and with strong winds from the opposite quarter there is a corresponding fall.

The Boca Guazú, the entrance to the Parana, lies about 12 miles northward of Martin Garcia; and the entrance to the Uruguay is about 9 miles farther north. The former is about $2\frac{1}{2}$ cables in width, but very deep and clear of shoals; the latter is $4\frac{1}{2}$ miles in width, and also very deep.

The Boca Guazú continues about the same width as far as the main stem of the river; but the Uruguay widens out immediately above the entrance, and has an average breadth of $5\frac{1}{2}$ miles as far as Fray Bentos. The western shore, between Martin Garcia and the rivers, is formed by low and wooded islands, fronted by an extensive shallow flat; the eastern shore is higher, and inhabited. The village of Las Vacas is on this shore in front of the Boca Guazú, and that of Higueritas is on the high land forming the eastern point of the entrance to the Uruguay.

AFFLUENTS OF THE PLATA.

Remarks.

The changes which are constantly occurring in the beds and banks of the rivers flowing into the Plata render it impossible to give any accurate description of them. But the following remarks on river navigation may be acceptable to those having no experience of their own.

Pilots are absolutely necessary; and however hard it may appear to pay them high wages, yet it is always better to secure good ones. The economy of time, fuel, and material will be an equivalent for the outlay.

All vessels should be provided with a number of hawsers of various sizes, which should be stowed conveniently for paying into boats on short notice. Keep the heavy purchases ready for use, the leading-blocks secured to bolts that will bear heavy strains, the capstans free from rust and other incumbrances, the kedges slung conveniently for lowering into the boats, the heavy anchors fitted for carrying out, and the boats that are to do the work in a condition to float them without the delay of trial when the critical moment arrives. The best spar on board should be fitted for use as a shore. This is often the only means of keeping the bow or stern from swinging; and in all cases it will be found of great assistance in heaving the vessel afloat.

When ascending the river the draught of water forward and aft should be equal; and if the vessel will steer as well and make about the same headway, it would be better to trim a few inches by the head. When descending, and the state of the river will permit, the vessel should be trimmed at least one foot by the stern. The first of these will prevent the vessel from grounding on steep banks, the latter

will render her less liable to swing broadside to the current when aground. The foregoing precautions are a few only of those which should suggest themselves to every seaman. It must be remembered that promptness in carrying out anchors and heaving a strain on the hawsers may save lying aground for months. As a rule, very little injury is received from occasional grounding; but when the vessel lies in 2 or 3 feet less water than she is drawing for several weeks, she is very apt to be strained, even where the bottom is soft and yielding.

The channel is indicated by the direction of the strongest current, the bubbling up of the waters, and the course taken by the drift and *débris*. The surface of the water over the shoals is nearly always still and smooth. If in doubt where to find the channel, close with the steepest bank and try the depth there. When ascending the river, should you observe that the vessel is out of the current and is passing the land faster than usual, you may be sure you are out of the channel. During a high river, the current often sets with great force over the banks, toward the shore and points, and into the openings through the banks. When descending the river, a boat may be sent ahead to sound and signal the depth and direction of the channel, but this is impracticable when ascending, on account of the current.

Vessels of heavy draught should not run after dark. The river steamers are piloted by men whose constant practice has rendered them experts in handling and finding the channels; such men as these are rarely available for foreign traders. The only locality where it would be safe to run during the night is between the mouth of the Parana and Rosario, and even here it would be much better to anchor at sunset when descending the river.

During fine weather the wind generally blows parallel to the direction of the river, whether it be from the northward or southward. Sailing-vessels find no difficulty in beating down, if they avoid the eddies, which prevent prompt handling.

Before letting go the anchor be sure that the vessel is head to the current. The utmost caution is necessary, to avoid snapping the cables; and no anchor should be let go without a buoy-rope long enough to make fast on deck and strong enough to weigh the anchor. It is preferable to

Anchoring.

anchor where the river is wide, for the current is not so strong and the depth of water not so great as in narrow reaches. In addition to this, the mosquitoes will be less troublesome.

Small vessels must avoid anchoring in any of the reaches trending N. and S., for a violent pampero blowing against the current would be apt to capsize them. Should a vessel be anchored in an exposed part of the river, every preparation for tripping the anchor and running for a sheltered reach should be made on the slightest indication of a pampero. When a vessel is made fast to the shore, the bow-lines should be led through the breast-chocks, so as to keep her head up to the current. It would be well, also, to have a light stern-line out to prevent swinging across the current, should a fresh wind come up suddenly. Avoid anchoring near an eddy.

Grounding.

The bed of the river being composed of mud and sand, grounding is of little injury to the keel and hull; but heaving afloat is tiresome work, involving the use of heavily-laden boats in strong currents. Intelligent pilots are of great assistance in laying out anchors, and from constant experience they will be found experts in the management of boats in a current. It is always better to treat their peculiarities with patient consideration, and so secure their hearty co-operation, than to get annoyed with them, and treat their suggestions with indifference or contempt.

The universal rule is to bring the ends of the vessel parallel with the direction of the current, and then heave ahead or astern, as the case may be. As soon as the current begins to set along both sides of the hull, it cuts the sand out from under the bottom, and greatly assists in getting afloat. Grounding on the lower side of a bank is the least trouble, for in this case it is generally sufficient to lower the boats, drop the bower anchors under foot, and reverse the engines, in order to float off. But should the river be falling, and the engines do not start her after a few revolutions with a good head of steam, carry out a good anchor, and lose no time in trifling with light kedges. Whenever it is possible to make the hawser fast to a tree on the bank, this should be preferred to laying out an anchor. It is useless to attempt to pull a heavily-laden boat up against the current; therefore, while the heavy anchors are being slung, and other

arrangements are in progress, send a light boat out with a kedge and long line, by which the heavier boats may be hauled out. It is a loss of time to commence heaving until all preparations have been made; and should a heavy strain be brought on one anchor with no success, before parting the hawser or cable, carry out another; in short, do not permit the temptation of "another heave" to cause the delay consequent to parting the cables or hawsers, dragging home the anchor, or disabling the capstan.

Decending the river is attended with more risk than ascending, on account of the increased speed caused by the current. Whenever a vessel touches the bottom, the first thing to be done is to keep her from swinging broadside to the current; for, as soon as she does, the sand will accumulate on the lower side, and the banks thus formed increase the difficulties of getting afloat. Finding it impossible to heave afloat, no time should be lost in lightening the vessel. The cargo, stores, &c., should be landed on the nearest bank which is steep to, so that you may reload without the use of boats. But do not commence to lighten until every preparation has been made for heaving afloat; otherwise the current will drive the vessel up on the bank as fast as she is lightened. The first movement is always the hardest to accomplish, for as soon as the current starts to run under the bottom, the loose sands wash away, and the water deepens with great rapidity.

Coal may be bought at Rosario, Parana, Corrientes, and Asuncion. Above Asuncion wood is used for fuel, and may be obtained at various points on the rivers. Extensive coal-fields are said to exist in Paraguay. These cannot long remain useless with the rapid increase of river commerce and demand for cheap fuel. Fresh beef, mutton, and other fresh provisions may be obtained wherever there is a farm-house.

Rosario and Parana are the only places above Buenos Ayres where ships' stores can be procured. When time is not the main object, the general rule for economizing fuel is to steam through the water at a rate not less than double that of the current, when ascending the river, and to keep good steerage-way when descending. The sails should be used whenever possible, especially when there are no bars or shallow reaches.

PARANA RIVER.

Rio Parana-
hyba.

The Parana river is formed by the junction of the Rio Paranahyba and the Rio Grande, in latitude 20° S. The Paranahyba rises in the Brazilian province of Goyaz* and flows to the southward, with many windings, along the western slopes of the serra das Vertentas, from which it receives many streams, the largest being the Corrente. After turning abruptly to the westward, it is joined by the Virissimo and Corumba from the northward and the Velhas from the southeast. Thence to its junction with the Rio Grande its course is southwesterly and it forms the boundary between the province of Goyaz and Minas Geraes, from which it receives numerous tributary streams.

Rio Grande.

The Rio Grande rises in the Mantiqueira mountains, near the registry of Picão, about 100 miles from Rio de Janeiro. After receiving sundry tributary streams, it flows to the northward for about 125 miles; then turning to the northeast, it receives the river Mortes, and is already navigable by boats for many miles. Turning subsequently to the westward, it is increased by the Sapucahy, San Pedro, and Pardo, and eventually serves as a boundary between the provinces of Minas Geraes and São Paulo, until it unites with the Paranahyba to form the Parana.

Parana river.

The Parana now serves as a boundary between the Brazilian provinces of Goyaz and São Paulo, and takes a southwesterly course; it is subsequently the boundary between the latter province and that of Matto Grosso, and between this and Parana. From its origin it receives a great many tributaries from both sides. It soon plunges over steep rocks, giving rise to the waterfall of Urubú-Punga, the noise of which is heard a distance of 6 or 8 miles. Below this waterfall it receives from the right the Cururuhy; about 10 miles below this the Tieté from the left, and 6 miles farther the Sucurihy from the right. A short distance below the mouth of the latter is the rapid of Jupiá. Thence in a course of 300 miles it receives the Verde, Pardo, Ivinheima, (with three mouths,) Ivahi, Amambahi, and Igatemi from the right; the Aguapehi, S. Anastacio, Paranapanema, and Piquiri from the left.

* The Brazilians write this Guayaz.

The Igatemi and Piquiri disembogue on opposite sides of an island about 60 miles in length. Just below this island the bed of the river becomes contracted, by the Maracapé mountain range, to a width of 150 feet. This chasm is divided into seven parts by precipitous rocks, between which the mighty river rushes with great violence and forms one of the grandest sights in the world, named Sete Quedas, or Seven Falls. Sete Quedas.

In the first 60 miles below the falls the Parana receives the Acarahi from the right, and above and below it the Jaguaré and Iguaçu from the left. It flows to S. for about 180 miles below the falls, receiving numerous tributaries of no importance; it then turns to SW. for 70 or 80 miles, and then to W. for 150 miles, where it is joined by the Paraguay. From the Sete Quedas to the Iguaçu it forms the boundary between the Brazilian province of Parana and the republic of Paraguay; thence to the mouth of the Paraguay it separates the latter country from the Argentine state of Entre Rios.

From the junction of the Rio Paranahyba with the Rio Grande to the mouth of the Paraguay the Parana encircles an immense number of islands. Some of these are many miles in length, others are grouped into extensive archipelagoes. Above the Sete Quedas the river-bed has a width of 6 miles, in which space there are an immense number of islands.

From the headwaters of the Rio Grande to the mouth of the Paraguay is a distance of about 1,500 miles by river; from the mouth of the Paraguay to Martin Garcia is 609 miles; making a total length of about 2,100 miles. In breadth, current, and volume, the Parana has ten times the magnitude of the Paraguay, which is itself superior to the largest rivers of Europe. But, owing to its rapid descent, and the mountainous character of the country through which it flows, the Parana is not navigable more than 250 miles above the mouth of the Paraguay. Length.

The rapids of Apipé were formerly considered the head of navigation; but Commander Page, formerly of the United States Navy, ascended above them with a vessel drawing 5 feet, after the river had fallen 8 or 9 feet below the average highest stage. These rapids are, however, a great obstruction to navigation; for it requires a speed of at least Head of navigation.

8 knots an hour to make any headway against the current ; and in the descent it is necessary to head the current, steaming sufficiently fast to give good steerage-way, and thus drift down between the rocks. The falls of Iguaçu, in latitude $25^{\circ} 50'$ S., are in reality the head of navigation ; thence to the Sete Quedas the bed of the river is a succession of rapids.

In general the eastern tributaries of the Paraguay and Parana are rapid, and offer no facilities for navigation. Those from the Andes, on the other hand, wind slowly through an immense extent of plain, and are available as the means of internal communication. The aspect of the river banks changes entirely below the falls of Apipé from steep and picturesque to low, flat, and marshy.

Below the Par-
aguay.

In the lower part of its course, below the mouth of the Paraguay, the Parana is everywhere deep, broad, and unobstructed, except at extremely low water, when there are a few bars, over which there is a depth of 8 to 10 feet. The right bank, being the edge of the extensive plains of the Chaco, is low, flat, and marshy ; it is nearly always inundated by a high river, and, when the waters have subsided, it is cut up into innumerable islands, covered with thick brushwood, which renders them inaccessible. The left bank is composed chiefly of low cliffs, 30 to 60 feet in height, which are the termination of the undulating plains of the Argentine province of Entre Rios.

The first elevation met with on the right bank in descending through the Argentine republic is San Lorenzo, near Rosario ; and the last on the left bank is the Punta Gorda, or Diamante, above the town of Parana, where commence the delta and the many arms through which the river empties into the Plata.

The breadth of the river is very variable ; in the upper part of its course, where it runs between high banks, the breadth averages about 500 yards ; but below the Paraguay it spreads out, and during a low river is from one to three miles ; sometimes in a great rise the breadth is many miles, the banks being inundated far beyond the limit of vision from the main channel. Great changes then occur ; new islands are formed, and others washed away ; the channels are constantly changing, and even the best pilots must stop to sound in order to find them. The bed of the upper river

is composed of rock ; below Corrientes it is composed of shifting sands and clay. To attempt a description of the labyrinth of channels and islands, or even to enumerate them, would result in confusion.

Among the many rivers which flow into the Parana below the Paraguay, three only are worthy of special mention as being of interest to the mariner. These are the Salado, Tercero, and Gualaguay. The Salado rises in the western Cordilleras of the province of Salta, and, after a very winding course to SE., empties into the Parana at Santa Fé, in latitude $31^{\circ} 45'$ S. This river was ascended in 1855, by Commander Page, in a small steamer drawing 22 inches, to Monte Aguara, a distance of 340 miles by river, and 96 miles in a right line from Santa Fé. Subsequently its navigability for a distance of 900 miles has been established. It flows through a country unequaled for pastoral and agricultural purposes, and brings into communication with the Atlantic some of the richest and most populous provinces of the Argentine republic.

Affluents.

Salado river.

The Tercero empties into the Parana 6 miles above San Lorenzo, under the name of Cacaraña, which it retains only in the province of Santa Fé. From its source in the sierras of Cordoba it is known as the Tercero, and it is joined by the Quarto at the distance of 120 miles from its confluence with the Parana. The various authorities are contradictory as to the navigability of this river, but judging from its average fall of $2\frac{1}{2}$ feet to the mile, it is probably not navigable for any great distance from its mouth.

Tercero river.

The Gualaguay river takes its rise in the interior of the province of Entre Rios, and empties into the Parbon, an arm of the Parana. The Gualaguay affords navigation for vessels of six feet draught up to the port of the town of Gualaguay, about 35 miles from its mouth ; and the Parbon is of sufficient depth for any vessel that can enter the Parana, and skirts throughout its extent the firm lands of Entre Rios.

Gualaguay river.

In addition to the above, there are a great many arms of the Parana which afford the means of extensive internal water communication for considerable distances from the main stem of the river.

A delta of vast extent is formed by the various branches of the Parana. Its apex, at the town of Diamante, in Entre

Delta of the Parana.

Rios, is distant from its base in a right line 178 miles, while its base, the line on which these branches empty into the Plata and Uruguay, is about 40 miles in extent. Diamante is assumed as the apex, because at this point, in ascending, the width of the river is contracted to 1 mile by the approach of firm, elevated lands. To give a description of the innumerable small branches up to this apex would tend to confusion. They, nevertheless, serve a useful purpose by giving access to a labyrinth of islands, the fruits and other products of which lead to an extensive trade with Buenos Ayres.

The main channel, the Guazú, at its confluence with the Uruguay may be said to bisect the delta, there being north of it the Brasso Largo and Brasso Bravo, and south of it the pass of Las Palmas and Arroyo Capitan. The latter, although narrow and shallow, is important as offering a water communication to the main or firm lands of the state of Buenos Ayres, which it skirts for some distance northward, enters the pass of Las Palmas, and thence becomes the most southern branch for many miles. A narrow stream sets off from it under the name of Baradero, and, washing the firm lands, joins the main river about 100 miles above Martin Garcia. From this point to the apex of the delta the main stem becomes its southern and western boundary. The most northern branches, forming at different distances the northern side, which is bounded in that direction by the province of Entre Rios, are, beginning from the Uruguay, the Brasso Largo and Brasso Bravo; the main river for the distance of 25 miles is the Parbon and the Parana Cito. This last, although tortuous, narrow, and shallow, possesses advantages similar to those of the Arroyo Capitan and Baradero, and branches off from the main river a few miles below Diamante, near the apex of the delta.

The depth of water throughout the delta, a distance of 245 miles by the main stem, is not less than 16 feet. The width of the river is from one-half to $2\frac{1}{2}$ miles, exclusive of its branches, which at some points extend 12 miles from firm land to firm land. The character of the bottom is sandy, except where the current is too weak to retain its detritus in a floating state. The average velocity of the current is $2\frac{1}{2}$ miles an hour.

Annual rise.

Two causes produce a rise of the Parana, enabling vessels

of 15 feet draught to ascend to Corrientes, and those drawing 8 or 9 feet to ascend the Paraguay as far as Cuyaba, 2,400 miles from the sea. The western affluents are swollen by the melting of the snows on the Cordilleras; the eastern by heavy rains which fall at certain seasons in the region where these rivers rise. There results from this great irregularity in the period of rise and height of the river, which is unknown in rivers where only one cause exists. The Parana is lowest in September and October; sometimes the lowest stage is reached in July or August. The river commences to rise about the end of October; continues rising during November, December, and January; attains its highest stage in February or March, and begins to fall in April or May. Besides this annual rise there are occasional freshets, caused by the heavy rains in Brazil. One of these takes place in October, when there is usually a rise of six feet, called by the natives, "repunte." The lower part of the delta is often swollen by a backing up of the waters of the Plata during a continuous SE. wind. The difference of level rarely exceeds 17 feet; the average annual difference is about 14 feet from its junction with the Paraguay to the delta.

Considering only the mean annual rise, a vessel drawing 14 feet may ascend to Corrientes with safety during a high river. Vessels drawing 17 feet have frequently ascended to Rosario, which is the head of navigation for sailing-ships. A draught of 10 feet may usually be carried as far as Parana at all seasons, but during the low river not more than 7 feet can be carried to Corrientes.

The chief obstructions appear to be the flats southward of Martin Garcia, where there is usually a depth of 13 feet in the channel at low water; the bars of Cruz Colorado and Rama Negra, where there is only 10 feet depth at extreme low water; just above the city of Parma $9\frac{1}{2}$ feet, and near Goya $8\frac{1}{2}$ feet. It must not be understood that the depth of water increases by the full amount of the annual rise, for the bed of the river, especially where it is shallow, undergoes a change of level, being elevated by a rising and cut out by a falling river. Thus it is that the depth of the channels varies with the river at the same height; and there is generally more water over the bars in the end than there was

at the commencement of the low river, although there has been no actual rise of the waters.

Current.

The average fall of the Parana below its junction with the Paraguay is three-tenths of a foot to the mile. But the great volume of water which it contains causes an average current of $2\frac{3}{4}$ knots an hour, 2 knots during a low and 3 to 4 knots during a high river. The rate of the current is generally in proportion to the depth of water, for where the river is narrowed it cuts out a deep channel and the current runs with great force.

Towns on the river-banks.

The only towns on the banks of the Parana of any commercial importance are Rosario, Santa Fé, Parana, and Corrientes. There are, however, many others having considerable local trade, which is being rapidly developed by the extraordinary growth of population in the Argentine republic. Rosario being the most important to the foreign trade, a special mention has been made of its trade, &c. Parana may become a great commercial center; in 1870 the value of its exports was \$1,107,000, the value of its imports (direct) \$21,820.

Remarks.

The hottest months at Parana are December and January, when the thermometer ranges from 54° to 95° F.; the coolest are June and July, when it rises after sharp frost in the early morning from 30° to 56° F. A great variety of game may be shot on the banks of the Parana.

PARAGUAY RIVER.

Source.

The Paraguay, the principal affluent of the Parana, issues from the Sete Lagôas, (seven lakes,) situated in an extensive elevated plain in the Pari mountains, a part of the sierra Diamante, forming the table-lands of the Brazilian province of Matto Grosso. The Sete Lagôas are situated in about $13^{\circ} 30'$ S. and $56^{\circ} 15'$ W., a distance of 200 miles southeast of the city of Matto Grosso and 150 miles north of the town of Cuyaba. The table-lands of Matto Grosso, having a mean elevation of 100 feet above the sea, separate the basin of the Parana from that of the Amazon, and give rise to many of the tributaries of both these great rivers.

Headwaters of the Paraguay and Amazon.

The nearest approach of the headwaters of the Paraguay to those of the Amazon is in the sierra Aguapahy, in which, on the northern side, the Alegre, a tributary of the

Guaporé, and on the southern side the Aguapahy, a tributary of the Jaurú, take their rise within a few yards of each other. The former is a tributary of the Amazon, the latter of the Paraguay; they flow to the eastward parallel to each other a distance of 20 miles, when they fall into a plain in latitude $14^{\circ} 53'$ S., forming between them an isthmus about $3\frac{3}{4}$ miles in width. Here, taking opposite directions, the Allegre flows into the Guaporé about 3 miles from Matto Grosso; and the Aguapahy, running to the eastward, enters the Jaurú after a further course of about 90 miles. In 1771 a boat was transported overland from the Allegre, a distance of $5\frac{1}{2}$ miles, and then launched into the Aguapahy. It was taken down the latter into the Jaurú, and then into the Paraguay, without encountering any serious difficulties.

The sierra Aguapahy, under the general name of Parecis, extends a considerable distance to the northeastward beyond Diamantino, a town established in 1821 in the mineral region, and forms the dividing ridge between the headwaters of the Paraguay and Guaporé; in other words, between the basin of the Plata and that of the Amazon. These mountains are very rich in copper and gold; the mines were formerly extensively worked, but owing to the supposed difficulties of communication with any sea-port, and want of labor, they were abandoned many years back.

In 1846, by way of the Tapajoz and Arinos, large canoes laden with merchandise from Para and destined for Cuyaba were transported across the dividing ridge, the ascent of which is gradual and the passage not difficult, and again launched into the Cuyaba in latitude $14^{\circ} 49'$ S. Although the distance of land transportation here is much greater than that across the isthmus between the Allegre and Guaporé, yet it is more practicable, and is sometimes made.

From the foregoing facts it would appear to be an easy matter to construct a canal between these waters, and thus complete a continuous inland passage from the mouth of the Plata to that of the Amazon. There are doubtless some obstructions to navigation in these winding rivers; but these are not of such a character as to present difficulties which could not be readily overcome. The wonderful results to be anticipated from such a work would seem to make the subject worthy of the serious consideration of the nations whose interests are most at stake.

Tributaries.

The first tributary of the Paraguay of any importance is the Preto, from the westward; the next, the Diamantino from the eastward. Below the latter the Vermelho, Sipotuba, Cabeçal, and Jaurú, which rise in the Sierra Aguapahy, enter the Paraguay from the westward, while from the opposite direction it is increased by numerous streams flowing from the Parecis mountains, and farther down by the three lakes, Obiraba, Gahiba, and Mandioré. The Sipotuba and Cabeçal are rich in gold, the Jaurú in copper. It is a fact worthy of mention that all the tributaries above Villa Maria, which have their source east of the Paraguay, are impregnated with salt or saltpeter, while those from the opposite direction are sweet waters.

Head of navigation.

Up to the Sipotuba the Paraguay maintains a width of from *two to three hundred* yards, and a depth of not less than *eight* feet; thence, above, it becomes contracted to between *seventy* and a *hundred* yards, with a depth gradually diminishing to *three* feet up to a point named Moro do Anjico, about thirty-five miles above Villa Maria, in latitude $15^{\circ} 49'$ S., the highest point reached by the United States exploring steamers, and estimated at not less than 2,200 geographical miles from the ocean. There is no reason to doubt that in the months of December, January, February, and March, a steamer of three feet draught could easily ascend at least 150 miles farther.

Sipotuba river.

The Sipotuba or Lipotuba was ascended to latitude $15^{\circ} 42'$ S., longitude $57^{\circ} 56'$ W., about 52 miles from its confluence with the Paraguay, by the United States exploring steamers. It was found to be, in width, depth, current, &c., the superior of the main river. The Jaurú is also navigable for a very considerable distance.

The exploring steamers were detained in latitude 17° S. while ascending by an accumulation of floating grass, which at the season of high water is uprooted, and floats with the current. At this particular point, when the river is at its highest stage, the waters spread over a vast extent of territory into lakes Obiraba and Gahiba. The depth of water at this point is very great, and the obstruction mentioned is held only by the banks, there being no perceptible current. One of the steamers ascended above this obstruction by circumventing it by way of the lakes.

These lakes were explored, and found to be beautiful sheets of water, navigable for vessels of 6 feet draught. The channel connecting the Obiraba or Ubiraba with the Paraguay is about 50 feet in width, 16 in depth, and 6 miles in length. The extent of the lake is doubtless very great at certain seasons of the year; but at low stages of the river it has a circumference of about 10 to 15 miles. A narrow channel leads from Obiraba to Gahiba or Gaiba lake, which is to the southward; this channel is about 14 miles in length and 12 feet in depth at low stages of the river. The general depth of Gahiba is about 12 feet; its length, north and south, about 8 miles, and its breadth 3 miles. No connecting channels could be found between Gahiba and Mandioré lakes. The passage connecting the former with the Paraguay is deep and of very small extent.

Lakes Obiraba and Gahiba.

The Cuyaba is the next important tributary met with in descending. The United States exploring steamers ascended this river also. The lower part of its course they named San Lourenço, from a tributary of the Cuyaba; but this is doubtless an error, the latter being the most important and largest of the two rivers. The Cuyaba, or Cuiba, rises near the headwaters of the Paraguay, in latitude 13° S., and after receiving many tributary streams, the principal of which is the San Lourenço, it flows into the Paraguay, in latitude 18° S. This river for 40 miles above its mouth varies in width from 200 to 300 yards, and in depth from 2 to 4 fathoms, current from 2 to 2½ knots an hour. Thence to the confluence of the San Lourenço, a distance of 55 miles farther, there is but little change, except in the current, which is more rapid. Above the San Lourenço the Cuyaba varies from 50 to 100 yards in width, with a depth of from 8 to 15 feet and a current of 1 mile per hour. The banks are low, being often inundated, and the depth given above is that found after the waters have fallen about 6 feet below the highest stages. The steamers ascended to Cuyaba, a distance of 250 geographical miles from the mouth of the San Lourenço, about 340 miles from its confluence with the Paraguay, and not less than 2,200 miles from Montevideo. In ascending, the banks of the river become higher, the country more populous, and agriculture more advanced. The width of the river averages about 200 yards, its depth at low water is not less than 4 feet up to San Antonio, 25 miles

Cuyaba river.

below Cuyaba, where the river-bed becomes rocky and contracted, with not less than 3 feet in the channels.

Cuyaba town. The town of Cuyaba, with a population of 10,000, is a thriving place, and promises to become a great commercial center. It is the capital of the Brazilian province of Matto Grosso. At the present time there is an established line of Brazilian steamers plying between Cuyaba and Montevideo, and stopping at all the important points on the rivers. The time consumed in ascending is about six weeks.

San Lourenço. The San Lourenço was explored up to its confluence with the Itiquira, or Piquira, and found to be navigable for vessels of 5 feet draught. The country through which it flows is an extensive pampa, intersected by numerous streams, affording a great extent of navigation for vessels of $2\frac{1}{2}$ feet draught.

Dourados. Dourados, the naval depot for the entire northwestern territory of Brazil, is destined to become a place of great importance. It is situated on the right bank, 16 miles below the mouth of the Cuyaba; it contains extensive work-shops and is to be made a first class naval station for constructing and repairing river-craft of every description.

Dourados to Corumba. From Dourados to Corumba, a distance of 105 miles, the Paraguay is not less than one-quarter of a mile in width nor less than 5 fathoms in depth, with a current of about 2 knots an hour, at times when the river has fallen 3 to 5 feet below its highest stage. The general course of the river is to the southward. The country on either side is one vast plain, with occasional interruptions of isolated, low, wooded hills, sometimes forming the margin of the river, and affording an abundance of fuel.

Mandioré lake. Mandioré lake lies westward of the sierra Dourados, on the eastern slope of which is the naval depot before mentioned. The entrance to the lake is south of the hills and a few miles below the post. The lake has a circumference of about thirty miles, and is navigable for vessels of 4 feet draught.

Remarks. The width of the Paraguay abreast of Corumba is about 600 yards, and the depth at low water about 15 feet. In the channel up to this point the least water found by the United States steamer *Water-Witch* was 10 feet, and the river had presented no difficulties to its free navigation by this vessel,

Corumba. an ocean steamer of 400 tons and 9 feet draught. Corumba

is the first settlement and military post met with in Brazilian territory below Dourados. It is a port of entry for the province of Matto Grosso, and since the opening of these rivers to Brazilian vessels it has increased rapidly.

In ascending the Upper Paraguay there are many routes through the various arms by which the rapid current may be avoided and the distance considerably shortened. A light-draught steamer may pass through the Bahia Negra into the Paraguaymi, which is about 15 miles below Corumba, and thus shorten the distance 35 miles. During high stages of the river, this "field navigation," as it is called, is much resorted to by pilots of the river-craft who are familiar with it. Remarks.

The Tacoary and Motetey or Miranda rivers, rising in the southern part of Matto Grosso, are the next important tributaries met with in descending below Corumba. The former is a considerable stream, navigable for many miles. Tacoary river.

The next important affluent of the Paraguay is the Otuquis, which flows from the rich Bolivian province of Chiquitos, and empties into the Bahia Negra, which in turn flows into the Paraguay in latitude $19^{\circ} 52'$ S. The navigability of the Otuquis has been established from the high lands of Bolivia for a long distance in its course to the SE., but it has not as yet been traced through the Bahia Negra. Commander Page made many persistent efforts to find a navigable channel from the Paraguay to the Otuquis, but failed from the want of a suitable vessel. He explored the Bahia Negra in the Water-Witch for a distance of 31 miles; subsequently in the Argentina and Alpha for 24 miles farther; and afterward in the Alpha alone, but without finding the channel. He describes the Bahia Negra as having an extent of 80 miles N. and S. and not less than this in a direction E. and W.; it is a boundless plain of grass and lagoons, with a depth of water varying from 3 to 6 feet. The importance of tracing the Otuquis through this lagoon or shallow lake can hardly be estimated; for once established it will give access to one of the richest countries in South America, now lying in an undeveloped condition from the want of easy communication with the sea. Otuquis river.

An abundance of water-fowl may be shot in the Bahia Negra; and wherever the lands are not inundated there is a great variety of other game. Great quantities of fish can be caught with hooks and lines. One specie, the Dorado, Fish and game.

is of golden color, from one to three feet in length, and 15 to 25 pounds in weight, the flesh being white, solid, and delicious eating. The strength of this fish is very great, and it will be found necessary to use strong lines and short but stout hooks in order to get it in board.

Latiriquiqui.
river.

The Latiriquiqui flows into the Bahia Negra near to its outlet into the Paraguay, and is said to discharge a volume of water which could come only from a large river. The

Blanco and Apa
rivers.

next tributary is the Blanco, from the eastward, and the next is the Apa, from the same direction. The former of these is claimed by Paraguay as its boundary with Brazil; but the Brazilians claiming the latter as the rightful boundary, so established it, when the recent treaty was signed between those nations.

Jejui river.

The streams flowing from the mountains of Paraguay, while increasing the volume of the river, do not add much to the water-communication leading from it, as they are invariably rapid and swollen during the rainy season, and little better than rills during the dry season. A few of them are, however, navigable by boats for short distances. Among these may be mentioned the Apa, having not less than 9 feet for a distance of 6 miles, and an average width of 300 yards for the same distance. The Jejui, perhaps the most important of all, courses through the Yerbales, and offers an easy communication for the conveyance of this product to San Pedro. Lieutenant (now Commodore) Daniel Ammen, U. S. N., ascended this stream at the season of low water. His remarks in reference to it are: "We had a succession of sand-bars up to this port, (San Pedro, in latitude $24^{\circ} 05' S.$, longitude $57^{\circ} 13' W.$,) on an average one to every four hundred yards. A steamer navigating the river, even to San Pedro, should not have a length greater than eighty feet, should be flat-floored, and be capable of making eight statute miles an hour, the average current being equal to three and a half."

Confuso river.

From the Bahia Negra to the Confuso, a distance of 650 miles by river, there are comparatively few tributaries from the west, while those from the east, although small, are constantly recurring. The Confuso, a narrow and tortuous stream, rises in the eastern Cordilleras of Bolivia, and after flowing through the saliferous districts of the Chaco, empties into the Paraguay, in latitude $24^{\circ} S.$ It has not been explored more than 24 miles from its mouth, but is doubtless

navigable for a very considerable distance. Its waters are bitter and brackish.

Between the Confuso and its confluence with the Parana, the Paraguay receives the waters of two considerable rivers, the Pilcomaio and Vermejo, the former in latitude $25^{\circ} 16'$ S., the latter in $26^{\circ} 52'$ S. Of the Pilcomaio little information can be given. Several attempts have been made to explore it, but all were unsuccessful. Azara ascended through the northern branch about 40 miles, and found not less than six feet depth, but a very rapid current. An attempt was made to descend the river in 1844, but the want of suitable means prevented success.

The Pilcomaio rises in a spur of the Cordillera of the Andes, northwest of Potosi, in Bolivia, and after receiving the Cachimayo, which rises within a short distance of Chiquisaca, it is joined by the Pilaya, from the southwest. The latter, fed by numerous tributaries, greatly augments the volume of the Pilcomaio, which, at a short distance from this junction enters the Gran Chaco, and flowing in a southwest direction, empties into the Paraguay opposite to Asuncion.

The Vermejo, or Bermajo, rises in the southern part of Bolivia, near to Tiraja, and after receiving a great many tributaries it flows in a general southeasterly direction, and enters the Paraguay about 50 miles above its junction with the Parana. The Vermajo is navigable the entire year a distance of 800 or 900 miles. It has recently been ascended a distance of 720 miles to Esquina Grande by a steamer belonging to a company formed expressly for developing its commerce. But a short distance separates the headwaters of the Vermejo from those of the Pilaya, which flows into the Pilcomaio, so that, even if the latter be not navigable, as it is feared, near its junction with the Paraguay, there can be little doubt that the Vermejo will answer all the purposes of a riverine highway from Bolivia to the basin of the Plata and thence to the Atlantic. The total length of this river is about 1,400 miles. It has been descended by an American, Mr. Hickman, in a boat drawing $3\frac{1}{2}$ to 4 feet, from Oran to the mouth, a distance of 1,200 miles; and in this distance there was no serious obstruction to navigation, although the river is narrow and winding.

The depth of the Vermejo varies from $3\frac{1}{2}$ to 30 feet during its lowest stages; the annual rise is about 12 feet.

Remarks.

The banks are skirted by an abundance of fine timber, suitable for building purposes and fuel. The breadth varies between 50 and 300 yards. The waters abound in fine fish; the banks with game of every description; the adjacent lagoons with many varieties of water-fowl. The neighboring country is inhabited by wandering tribes of Indians, whose treachery is proverbial. The swiftest current in the Vermejo does not exceed 5 miles an hour.

Tacoary river.

The Paraguay flows to the southward between the meridians of 56° and 59° W., a distance of nearly 2,000 miles following the bed of the river, and 840 in a direct line. Vessels drawing 12 to 13 feet may ascend to Asuncion, and those drawing 6 feet to Cuyaba, during the annual rise. A draught of 9 feet may be taken to Asuncion during the greater part of the year, and the least water ever known on the shoalest bars below this point is 5 feet. The height

Otuquis river.

of the river above the level of the sea at Asuncion is 253 feet, and at its sources in Matto Grosso 1,020 feet.

The width of the river varies from 200 to 600 yards up to Asuncion. Above this point the river-bed becomes gradually more contracted. It is more even and less encumbered than the Parana. Below 23° S. it is composed of sand and clay, but above rock becomes very frequent. It has comparatively few islands, a tortuous course, and a more open channel than the Parana. The average rate of current varies from 1 knot during a low and falling to $2\frac{1}{2}$ knots during a high and rising river.

The banks of the Paraguay up to Asuncion rarely exceed 25 feet in height. To within a short distance of this town their geological formation is unvarying—a substratum of yellowish sand about 10 feet in thickness, a middle stratum of earthy clay, and a surface of virgin soil of about 3 feet. The timber is everywhere abundant, and of excellent quality for fuel.

The Paraguayan shore is lined with military outposts from 3 to 5 miles apart, each containing 3 to 5 men. The opposite bank is uninhabited, except in a few places, owing to the wandering Indians who frequent the neighboring country.

Fish and game.

The navigation of the Paraguay is easy, and can be accomplished without the assistance of a pilot, because there are few shoals in the middle of the river, and as they are rocky and covered with sand, they do not shift. In ascend-

ing or descending, keep at a little distance from either bank, and on arriving near a point, steer for and along the opposite bank. If any doubt exists about the direction of the channel, sound with the boats.

The city of Asuncion, the capital of the republic of Par-
aguay, is the only town open to foreign commerce. The
prostration of the trade of the country during and since the
war ending in 1870 has been very great; but with more
liberal notions, and the increasing river-traffic, it is probable
that Asuncion may become an important city. The au-
thorities consulted vary from 1,700 to 48,000 as to the
number of its inhabitants. In 1856 there were about 12,000,
according to Page. Fronting the city there is a stone quay
for facilitating the loading and discharging of vessels. The
best anchorage at Asuncion is close to the shore, in 3
fathoms, with the flag-staff over the office of the captain of
the port bearing S.E., distant about $2\frac{1}{2}$ cables. The police
and custom-house regulations are harsh and exacting to
strangers. Steamers ply regularly between Asuncion and
Buenos Ayres, and between the former and Cuyaba.

Asuncion.

The annual rise of the Paraguay commences in February
and continues until June; the river then falls gradually.
Its rise is, however, very irregular. The rise and fall at
Asuncion were observed by Lieutenant (now Commodore)
Ammen between October 1, 1853, and March 31, 1854. The
following table, taken from his journal, will give a clear idea
of the general fluctuations of the water-level:

Annual rise.

Statement of the rise and fall of the Paraguay at Asuncion.

	Ft.	In.
October 1 to 24, supposed fall by marks.....	2	..
October 24 to 31, by staff, river fell.	..	8
October 31 to November 29, river fell.....	2	6
November 29 to December 27, river fell	4	..
December 27 to January 5, river fell.....	2	5
January 5 to January 12, river fell	..	8
Total fall from October 1 to January 12	12	3
January 12 to 21, river rose.....	..	11
January 21 to February 5, river fell.....	1	11
Total fall from October 1 to February 5.....	13	3
From February 28 to March 31, river rose.....	5	9

When the Paraguay is very low the Parana is usually very high ; the waters of the latter then force back those of the Paraguay and cause a rise for many miles. The mean difference between the highest and lowest stages is 10 feet, the greatest 14 feet. The latter overflows the banks and occasions great loss to the inhabitants of the neighboring country.

URUGUAY RIVER.

Source

The Uruguay has its source on the western slope of the sierra do Mar, in the Brazilian province of Santa Catharina. During the first 75 miles of its course it flows to the north-west through the plains of Vaccaria, where it unites with the Pellotes, and is increased by numerous tributaries of little importance. It is subsequently joined by the Pepiriguassu and turns to the southward, forming the boundary between the Brazilian province of Rio Grande do Sul and the Argentine state of Entre Rios, from both of which it receives numerous tributary streams. From its junction with the Ibicui, which flows from the sierra Geral, it becomes the boundary between the republics of Argentina and Uruguay.

Salto.

About 30 miles below the mouth of the Ibicui, and 250 miles above the confluence of the Uruguay and Parana, is the Salto or falls of the Uruguay, which is the head of navigation, except when the river is very much swollen. The upper river is, however, navigable above the Salto as far as the Pellotes, and still farther by boats. The Salto is frequently ascended, although at low stages of the river a bed of projecting rocks extends clear across. During its ascent by Commander Page not less than 20 feet depth was found on the shoalest part, and the current was so swift that all the power of a ten-knot steamer was required to overcome it.

Tributaries.

Below the Salto the Uruguay receives many more tributaries, and is gradually increased. Its chief tributary is the Rio Negro, which rises in the northeastern borders of the republic of Uruguay, and flowing across this country empties into the Uruguay about 15 miles from its mouth.

Navigation.

The navigation of the Uruguay is not as difficult as it is in the Parana. Steamers of 5 or 6 feet draught may ascend

Entrance.

to the Salto at any season of the year. The entrance is 20 miles above Martin Garcia. It is formed on the west by the

mangrove swamps of the delta of the Parana, and on the east by some elevated land, terminated by two headlands: Punta Gorda, a wooded bluff 85 feet in height, and Punta Chaparo, 5 miles to the northward. Above the latter the river widens out to an average breadth of 5 miles, which is maintained as far as Fray Bentos.

The aspect of the Uruguay is altogether different from that of the Parana. In the lower part of its course as far as Fray Bentos, a distance of 90 to 100 miles, it has the appearance of a lake from 6 to 9 miles in width. It is here shallow, but a deep channel extends the entire length of this lake, enabling all vessels that can cross the flats of Martin Garcia to ascend to Paisandu, 150 miles from its mouth. Above Fray Bentos the river narrows rapidly to from 500 to 1,100 yards.

The right bank, Entre Rios, is generally low, wooded, and monotonous, with occasional elevations of 100 to 180 feet; but the left bank, that of Uruguay, is formed by pretty, undulating hills, reaching occasionally an elevation of 200 to 500 feet, intersected by numerous streams, with settlements along their banks. The principal towns of Entre Rios are on the Uruguay, but, the banks being frequently overflowed, they are built from 5 to 10 miles inland. The most frequented port is that of Fray Bentos, which is the landing for the town of Gualeguaychu, situated on the stream of this name. In this part of the river the channel is nearest to the eastern bank. It is necessary to cross to the other side, a distance of 6 miles, in order to enter the Gualeguaychu, which has a bar in the entrance, but may be ascended by small craft a distance of 5 or 6 miles. The difficulty of loading and discharging is great, owing to the shallowness of this part of the river. The produce is hides, tallow, bones, and jerked beef.

The next port is Concepcion del Uruguay, situated a little below Paisandu, a place where a large number of foreign vessels trade to. The little river Concepcion admits vessels of light draught. Here is embarked all the produce of the neighboring *estancia* one of the largest in the state. A line of steamers plying between Buenos Ayres and Salto touch at all the important points along the river.

The length of the Uruguay is about 900 miles. The most difficult passes in the lower river are either buoyed or

marked by stakes. Pilots may be obtained at Buenos Ayres, Montevideo, or Conception; the usual charge is \$4 per day. Supplies may be obtained at all the towns on the river. Coal is scarce; but wood, which answers well for steaming purposes, may be obtained.

Rise of the river. The Uruguay is subject to periodical rises, occasioned by the abundance of rain falling in the provinces of Brazil, where its tributaries rise. The annual flood usually occurs in September or October, sometimes with great rapidity, and where the river is narrow causing a current of 2 to 5 knots an hour. The average rise is 20 feet. In October, 1864, the water rose 30 feet at Salto, and at this point the difference of level between January and June, 1865, was 40 feet. The strength of the current depends upon the height of the river. During the flood it runs from 2½ to 4 knots an hour, at other times about 1½ knots, and is much influenced by the wind. The wind generally follows the course of the river, and facilitates its navigation by sailing-vessels. Besides the annual rise, there are occasional floods at all times of the year.

Caution. When loading in the Uruguay, you should be careful to consider the state of the river, so as to avoid detention. In 1870 the English gun-boat Cracker, drawing 8½ feet, was detained at Corcordia three months (June, July, and August) waiting for the river to rise. In some of the shallow passes there was only 6 feet depth of water.

River distances. The great discrepancy existing between the river distances given by various authorities, and the many contradictions on this subject contained in the work of Commander Page, cause some hesitancy in publishing the following table, which has been compiled from the charts of this office constructed from the surveys of United States officers :

Table of river-distances by the main channel, except where otherwise stated.

River.	Places.	Miles.
La Plata.....	Buenos Ayres to Colonia, (direct)	26½
	Buenos Ayres to Martin Garcia, (direct).....	25½
	Colonia to Martin Garcia, (direct).....	26½
	Martin Garcia to Parana Guazú.....	12½
	Martin Garcia to Higuieritas, (mouth of the Uruguay).....	21
Parana.....	Martin Garcia to San Pedro.....	100

Table of river-distances by the main channel, &c.—Continued.

River.	Places.	Miles.
Parana	San Pedro to Rosario.....	*78
	Rosario to Diamante.....	†60
	Diamante to Parana.....	‡30
	Parana to first bar, with ten feet, three and one-half miles above Juan Gomez point.....	70
	Parana to La Paz.....	§84
	La Paz to second bar, with ten feet.....	5
	La Paz to third bar, with eleven feet.....	15
	La Paz to Tala pass, with ten feet.....	62
	La Paz to Patril pass, with nine feet.....	85
	La Paz to bar between Puerto Tunis and Guaveya point.....	143
	La Paz to Goya arm.....	|| 119
	La Paz to Bella Vista.....	170
	Bella Vista to Corrientes.....	71
	Corrientes to mouth of Paraguay.....	16
	Total, from Martin Garcia to mouth of Paraguay.....	¶ 609

* Page gives 92, Mouchez 68, miles.

|| Page gives 145.

† Page gives 67.

¶ Mouchez makes this 611 miles; Page 760

‡ Page gives 36.

statute miles.

§ Page gives 102.

From Martin Garcia to the Salto Apipé, on the Parana, is a distance of about 750 miles, and thence to the falls of Iguacu about 300 miles more.

Table of river-distances on the Paraguay and Uruguay; by Mouchez.

River.	Places.	Miles.
Paraguay	Martin Garcia to the month of the Paraguay.....	609
	Mouth of the Paraguay to Humaita.....	23
	Mouth of the Paraguay to Nembuco or mouth of Vermejo....	48
	Mouth of the Paraguay to Asuncion.....	212
	Mouth of the Paraguay to Concepcion.....	361
	Mouth of the Paraguay to Apa river.....	483
	Mouth of the Paraguay to Pan de Azucar.....	539
	Mouth of the Paraguay to Comibra.....	682
	Mouth of the Paraguay to Albuquerque.....	721
	Mouth of the Paraguay to Cuyaba river.....	886
	Mouth of the Paraguay to Cuyaba town.....	*1, 220
	Mouth of the Paraguay to Moro do Anjico, thirty-five miles above Villa Maria.....	†1, 500
Uruguay.....	From Martin Garcia to Fray Bentos.....	71
	From Martin Garcia to Concepcion del Uruguay.....	122
	From Martin Garcia to Paisandu.....	134
	From Martin Garcia to Salto.....	186

* Page gives this distance as 2,400 miles from Montevideo.

† Page.

Table of the positions of the most important points on the Plata and its affluents ; by E. Mouchez, French navy.

[The longitudes are reckoned from the meridian of the custom-house at Montevideo.]

Name of place.	Latitude.	Longitude.
	° ' "	° ' "
Buenos Ayres, (Merced church)	34 36 28 S.	2 10 01 W.
Colonia, (the point)	34 28 20 S.	1 39 28 W.
Parana port, river Parana	31 42 17 S.	4 20 32 W.
Santa Fé port, river Parana	31 39 25 S.	4 30 36 W.
Corrientes port, river Parana	27 28 01 S.	2 38 43 W.
Cerrito, mouth of the Paraguay	27 17 30 S.	2 25 14 W.
Humaita, (casemate battery,) Paraguay river	27 04 10 S.	2 17 21 W.
Nembuco port, Paraguay river	26 51 08 S.	2 07 57 W.
Oliva port, Paraguay river	26 00 47 S.	1 40 14 W.
Villa Franca port, Paraguay river	26 18 50 S.	1 59 32 W.
Villeta port, Paraguay river	25 30 50 S.	1 22 56 W.
Asuncion port, Paraguay river	25 16 49 S.	1 27 42 W.
Paisandu port, Uruguay river .....	.....	1 23 48 W.
East Point light-house, (the Plata)	34 58 15 S.	1 15 39 E.

The latitude of the custom-house at Montevideo is 34° 54' 15" S. The longitude has not yet been accurately determined. That adopted by Mouchez is 56° 09' 36" W. of the meridian of Greenwich ; that adopted by this office is 56° 11' 41" W. A line of telegraph-wire having been completed from Europe to the principal South American ports, the exact longitudes of these ports will, doubtless, soon be determined.

ALPHABETICAL INDEX OF NAMES.

A.		Page.			Page.
Acarahi river	.....	135	Barracas town	.....	71, 79
Aflar point	.....	23, 24	Barragan bay	.....	65, 67
— reef	.....	24	Basuras bay	.....	25
Agnapahy river	.....	141	Bayonne	.....	92
— sierra	.....	140, 141, 142	Beaunanoir rock	.....	54
Agnapehi river	.....	134	Belgium	.....	75, 76, 90, 91
Agudo de Navarro, cerro	.....	15	Belgrano village	.....	93
Albuquerque town	.....	153	Bermajo river	.....	147
Alegre river	.....	140, 141	Betet cerro	.....	17
Amambahi river	.....	134	Bisson reef	.....	7, 8
Amazon	.....	2, 140, 141	Blanca lagoon	.....	13
Anastacio river	.....	134	Blanco river	.....	146
Angostura point	.....	51	Boca bank	.....	70, 71
Animas point	.....	21	— de Mini	.....	13
— sierra	.....	1, 14, 16, 17, 23	— Guazú	.....	20, 131
Apa river	.....	146, 153	Bolivia	.....	80, 87, 94, 96, 147
Apipé rapids	.....	135, 136	Babay wreck	.....	102
Agnidaban town	.....	87	Bordeaux	.....	92
Arapey river	.....	37	Brasso Bravo	.....	138
Archimedes bank	.....	2, 103, 120	— Largo	.....	138
Argentine Republic, 3, 40, 42, 44, 72-88, 94, 96, 97, 137, 140, 150			Brava point	.....	25, 29, 103, 109, 111, 120
Arinos river	.....	141	Brazil, 15, 38, 39, 40, 41, 42, 43, 76, 78, 81, 82, 83, 86, 88, 90, 96, 146		
Arrecife anchorage	.....	9, 10	Buceo point	.....	24, 27
— point	.....	17	— village	.....	25
Arroyo Capitan	.....	93, 138	Buenos Ayres custom-house light	.....	68
Artillera point	.....	50, 123	— — city, 4, 39, 41, 43, 44, 56, 67, 71, 72, 73, 78, 79, 80, 81, 85, 88, 89, 90, 91, 92, 94, 96, 105, 133, 149, 151, 152, 154		
Asperezas de Maldonado	.....	16	— — guard-ship	.....	68, 69, 124, 125
Astrolabe bank	.....	2, 103, 104	— — province	.....	73, 81-87
Atalaya point	.....	62, 64, 65	— — roads, 3, 22, 68, 69, 70, 71, 72, 76, 93, 109, 110, 112, 114, 117, 118, 121, 124, 126, 127		
— river	.....	64	Buen Viaje shoal	.....	28
Asuncion town, 43, 79, 133, 147, 148, 149, 153, 154			Buena Vista cerro	.....	5, 7, 8, 12
Austria	.....	78	Bump shoal	.....	26
B.			Burros point	.....	23
Bahia	.....	43	C.		
Bahia Negra	.....	145, 146	Cabecal river	.....	142
Bella Vista	.....	153	Cabo shoal	.....	59
Ballena point	.....	16, 17, 22, 23	Cacaraña river	.....	137
Ballena sierra	.....	16			
Banda Oriental	.....	36, 39, 40			
Baradero	.....	138			

	Page.
Cachimayo river.....	147
Caleta Chica cove.....	29
—— point.....	29
Camaron bank.....	68
Canal del Infierno channel.....	57, 58
Carape cerro.....	16
Carbonero sierra.....	15
Cardal lagoon.....	13
Carretas point.....	24, 27
—— reef.....	26, 27
—— rock.....	9
Castillo cape, 3, 4, 5, 6, 9, 12, 15, 16, 21, 99, 100, 108, 116, 118, 119	
—— Chico island.....	5, 6
—— Grande island.....	5, 6, 12
Castro point.....	45
Catalina channel.....	69
Catamarca province.....	73, 85, 96
Cathedral light, (Montevideo).....	29, 30
Cerrito town.....	154
Cerro Largo department.....	37
—— light, 28, 29, 30, 31, 32, 45, 46, 48, 101, 103, 124, 125	
—— point.....	23
Cerro of Montevideo.....	31
Chaco.....	2, 136
Chafalote cerro.....	8, 15
Chascomos town.....	78
Chico cerro.....	15, 17
—— bank.....	2, 64, 106, 121, 125, 127
—— light-ship.....	64, 124, 125, 127
—— point.....	128
Chili.....	78, 80
Chiquitos province.....	145
Chivilcoi.....	79
Chuelo river.....	51
Chuquisaca river.....	147
Chuy river.....	21
City banks.....	68, 69, 72
Coast bank.....	106, 107
Coimbra town.....	153
Colare point.....	67
Colonia cathedral.....	55, 107, 127, 128
Colonia del Sacramento department.....	37
Colonia light, 50, 51, 52, 53, 54, 55, 107, 122, 123, 124	
—— point.....	124
—— roads.....	1, 51, 53, 54
—— town, 37, 49, 51, 52, 122, 123, 127, 152, 154	

	Page.
Concepcion del Uruguay	151, 152, 153
— town, (Paraguay)	153
— river	151
Concordia	87
Confuso river	146
Copiapo province	96
Cordoba city	73, 78, 96
— province	73, 85, 96
Corcordia town	152
Coronilla point	5, 6
Corrales town	87
Corriente river	134
Corrientes province	73, 82, 86, 87
— town, 83, 86, 133, 137, 139, 140, 153, 154	
Corumba river	134
— town	144, 145
Cruz Colorado bar	95, 139
Cufre river	49, 122, 123
Cuiba river	143
Cuirassier bank	2, 3, 63, 105, 106
Cumberland rock	26
Curunhy river	134
Cuyaba river	141, 143, 153
— town	86, 139, 140, 141, 144, 149, 153

D.

Daiman river.....	37
Dart shoal.....	45, 48
Diamante sierra.....	140
—— town.....	136, 137, 138, 153
Diamentino river.....	142
—— town.....	141
Difuntos cerro.....	15
Dolores town.....	78
Don Carlos farm.....	16
Dourados sierra.....	144
—— station.....	144, 145
Durazo department.....	37
—— town.....	38

E.

East bank.....	18, 19, 20
—— point ..	14, 16, 17, 19, 20, 21, 22, 100, 104
—— — light-house.....	154
Embudo point.....	63, 64
Eucantada island	7, 8
English bank, 2, 3, 4, 99, 100, 101, 102, 103,	104, 108 119, 120
—— — light-ship	101, 102
English port.....	23

	Page.
Ensenada town	79
Entre Rios province, 73, 82, 83, 84, 85, 86, 87, 135, 136, 150, 151	
Espinillas <i>isla</i>	62
Espinillo point	45, 46, 48, 122
Espinosa islet	9, 11
Esquina Grande	147
Etna rock	55
Europe	39, 42, 44

F.

Familia rocks	32
Farallon islet and reef	53, 55, 56, 128
Fishers' banks	53, 55, 123
Flores island	4, 24, 25, 28, 102, 111, 120
— light	25, 26, 27, 28, 29, 101, 102, 103
Florida department	37
Forest King reef	27
France, 38, 40, 42, 73, 75, 76, 83, 89, 90, 91, 92	
Fray Bentos town	130, 151, 153
French bank	2, 104

G.

Gabriel point	29
Gahiba lake	142, 143
Garçon lagoon	13
Genoa	91
Geral sierra	150
Germany	42, 76, 78, 89, 90, 92
Glasgow	91
Gorriti island	17, 18, 19, 20
Goya arm	153
— town	139
Goyaz province	134
Grau chaco	73, 87
Granite point	17
Great Britain, 38, 40, 42, 75, 76, 78, 81, 83, 89, 90, 91, 92, 94	
Gregorio bank	121
Griffon rock	30
Guadalupe department	37
Gualagnay river	137
Guauguai town	79
Guauguaychu town and river	151
Guapore river	141
Guaveya point	153

H.

Hamburg	91
Havre	91, 92
Higuerita town	130, 152

	Page.
Holland	76
Hornos islands	53, 54, 55, 56, 111, 128, 129
Humaita	153, 154
Hydra Rock	30

I.

Ibicui river	150
Igatemi river	134, 135
Ignacu falls	136, 153
— river	135
Ilha de Tierra	5
Inuan point	23
Indio bank	121
— point	62, 63, 64, 65, 105, 106
— — light-ship	63, 124, 125
Infierno channel	111, 129
Ingles cerro	17
Inner road, Buenos Ayres	69, 70, 72
Isla Falsa	9
— point	68
Islote	7
Italy	38, 42, 73, 76, 78, 89, 90, 91, 92
Itiquira river	144
Ivahi river	134
Ivinheima river	134

J.

Jaguaré river	135
Jaurú river	141, 142
Jejuí river	146
Jesus Maria point	48, 49, 121, 123
— — spit	122
José Ignacio point	12
Juan Gomez point	153
Juan Jerónimo down	61
Jujui	96
Jujuy province	73
Juncal <i>isla</i>	61
— island	129
Jupia rapid	134

L.

Laguna Blanca	13
Laja bank	53, 54, 56
La Paz town	153
Lara bank	67
— point	1, 66, 67, 124
La Rioja province	73, 82, 87
Las Conchas river	93

	Page.		Page.
Las Conchas town	78	Meldroza islet	25
Las Palmas pass.....	138	Memoria point	62
Las Vacas.....	129, 130	Mendoza province.....	73, 74, 80, 87, 96
Latiriquini river	146	Mercedes	96
Lima	80	Merlo town.....	79
Lipotnba river.....	142	Middle channel	124
Liverpool	91, 94	Minas department	37
Lobos island .3, 4, 14, 15, 91, 25, 99, 100, 108, 118, 119, 120		Minas Geraes province	134
—— point.....	30, 32, 45	Miranda river	145
—— town	79	Monarch rock.....	19, 20, 22
Loma de Narvaez mount	16	Monte Agnara	137
Lopez islets	54, 55, 56	Motety river	145
—— road	55	Montevideo bay .22, 25, 29, 30, 31, 32, 33, 34, 35, 39, 44, 113, 117, 120, 121, 124	
Los dos Hermanos islands and bank	129	—— eathedral	46
Los Tres Cerros.....	16	—— cerro	45, 122, 124, 126
Luz islet	27, 28	—— city...2, 3, 4, 22, 34-44, 80, 91, 105, 144, 152, 153, 154	
M.		—— department	37, 47
Magdalena church and village .63, 65, 106, 107, 125, 7		Moro do Anjico	142, 153
Maldonado bay	3, 17, 22, 23, 111	Mortes river	134
—— department.....	37	N.	
—— light	102	Narcisse bank	103
—— morros	16	Narvaez cerro	9, 12
—— point.....	13, 108	Negra point.....	16, 23, 24, 120
—— rivulet	13	Nembuco town	153, 154
—— tower	19, 20	New rock.....	19, 20
—— town	21, 37	New York.....	43
Mandioré lake	142, 143, 144	North channel	121
Manuel point	56	Norway	42
Mantiqueira mountains	134	O.	
Mar sierra.....	150	Obiraba lake	142, 143
Maracapé mountains	135	Observation <i>isla</i>	62
Marcos island.....	5	Oliva town	154
Mark rock.....	27, 28	Olivos bay	92
Marseilles	92	—— point	92, 93
Martin Chico point	56, 129	Oran town	96, 147
Martin Garcia channel.....	57, 95, 128	Ortiz bank .2, 49, 104, 105, 106, 107, 116, 117, 124, 125, 127	
—— — flats.....	139, 151	Otuquis river.....	145
—— — island ..56, 57, 58, 79, 83, 111, 128, 129, 130, 135, 152, 153		Onter road	68, 69, 70, 71, 72
Matto Grosso province ..2, 86, 134, 144, 145		Oyarvide reef	7
—— — table-lands	140	P.	
—— — town	141	Paisandu department.....	37
Mauricio cliffs	47, 48	—— town	40, 151, 153, 154
Medano Alto hill	51	Palmos flat	57, 68, 70, 93, 127
Medano Chato hill.....	59	Palermo Chico.....	69, 70
Medano point.....	59		
Meduse bank	2, 103		

	Page.		Page.
Paloma islet.....	9, 10	Pipas reef, (eastward of Monte-	
— port	10, 11, 111	video).....	26
Pan Azucar	14, 16, 22, 23, 24	— —, (westward of Monte-	
— —, Paraguay river	153	video).....	50, 51, 122, 123
Pando river and town	24	Piquira river	144
Panela light-ship	46, 48, 121, 124	Piquiri river	134, 135
— rock	45, 46, 121	Plata bank	99, 100, 119
Para city.....	141	Playa Honda flat	57
Paraguay republic.....	40, 79, 80, 82, 86, 87, 91, 93, 96, 113, 135, 146	Polonio cape	6, 7, 8, 9, 12, 15, 21
— river ...	2, 43, 74, 83, 135–150, 153, 154	— reef	8, 9, 12
Paraguaymi river	145	Porcillos Cove	29
Parbon river	137, 138	Porto Riuz town	9
Parana Cito	138	Portugal	42, 78
— de las Palmas.....	93	Potrero bay	23
— Guazú	1, 93, 152	Pozos	68
— province.....	134, 135	Preto River.....	142
Parana river ...	1, 2, 57, 74, 79, 83, 87, 93, 95, 96, 111, 129, 134–148, 150, 153	Puerto Tunis.....	153
— town, 84, 85, 133, 136, 139, 140, 153, 154		Punta Chaparo	151
Paranahyba river.....	134, 135	Punta del Este.....	1, 14
Paranapanema river.....	134	Punta de Rocha.....	9
Pardo river	134	Punta del Rodeo.....	9
Parecis mountains	141, 142	Punta Gorda	129, 136, 151
Pareda point.....	56	Punta Rasa	1
Pari mountains.....	140	Punta Rubia	9, 11, 12
Patagonia	73		
Patosi	147	Q.	
Patril pass	153	Quarto river	69–137
Pavon anchorage	49	Quilmes point.....	67
— point	49, 50, 122, 123		
— river	49, 122, 123	R.	
Pedegral point	45	Rama Negra bar	95, 139
Pedro Lopez point	24	Rasa island.....	
Pepiri Guassu river	150	— point, (north coast).....	23
Perez point	29	— point and spit, (south coast)..	59, 60
Peru.....	78, 80	Ratones island.....	32, 33
Pereyra river	49	Recoleta.....	68, 69, 70, 89, 92
Pescadores	13	Relampago rock	55
Picão	134	Residencia	69
Piedras bank.....	62	Retiro point	92
Piedras Blancas rocks.....	30	Riachuelo river	67, 70, 71, 90
Piedras Negras Point.....	24	Rincon de Aleibas.....	48
Piedras point, (outside).....	1, 3, 12, 13, 16	Rincon del Cufré.....	50
— —, (inside) 61, 62, 107, 108, 111, 124,	126	Rio Grande	134, 135
— —, (Montevideo bay)	39	Rio Grande do Sul	39
Pilaya river	147	Rio de Janeiro.....	6, 41, 43, 44, 86, 134, 150
Pilecomaio river	72, 147	Rio Negro	37, 150
Pillotes river	150	Rocha lagoon.....	11, 12, 13
		Rodeo anchorage.....	111
		Rodeo isla.....	61
		Rosario city .43, 78, 87, 91, 93, 94, 95, 96, 97,	
		131, 133, 136, 139, 140, 153	

	Page.		Page.
Rosas mount	61	Santa Lucia cliffs	47, 48
Rossario point	49, 50, 123	— — flat	121, 122
— river	50, 111, 122	— — river	1, 45, 46, 47, 111
Rouen bank	104	— — town	47
S.		Santa Maria cape .4, 9, 10, 11, 12, 13, 15, 37,	99, 107, 111, 115, 119
Salado river	137	— — light	10
— —, (Buenos Ayres)	61	— — point	47, 48, 121
Salta province	73, 80, 137	Santa Rosa beach	24
Salto Apipe	153	Sandy point	48, 49
Salto department	37	Santiago bank	66, 127
Salto falls, (Uruguay)	150	— point	64, 66
— town	38, 151, 152, 153	— woods	65
Salvador Grande cerro	62	Santiago de Chili	96
San Antonio cape .1, 59, 60, 100, 104, 106, 115		Santiago del Estero	73, 96
— — town	143	Sara bank	26
San Borombon bay	60, 62, 106	Sarandi point	29, 30, 33, 35
— — river	61	Sarina reef	32
San Carlos town	21	São Paulo province	134
San Clemente anchorage	111	Sapueahy river	134
San Francisco convent	69	Sauce point	50, 122, 123
San Gabriel islet	53, 54, 55, 56	Sebollati river	37
San Gregorio point, cliffs, and river .	47, 48	Seca island	7, 8
San Ignacio morro	16	Sete Lagoas	140
San Isidro point	92	Sete Quedas	135, 136
San José department	37	Seven Missions	40
— — fort	30, 32	Silla Chica and Grande	16
— — point	29, 33, 34, 109	Sipotuba river	142
— — river and town	47	Solis Chico river	24
San José Ignacio lagoon	13	Solis Grande river	21, 23
San Juan cerros	56, 57, 118, 128, 129	Solis reef	23
— — province	73, 85, 87	Soriana department	37
— — river and tree	56	South channel	124, 125, 126, 127
San Lorenzo town	136, 137	Spain	33, 42, 44, 73, 76, 78, 90
San Lourenço river	143, 144	Sucurihy river	134
San Luis	73-96	Sweden	42
San Miguel fort	15	T.	
— — river	49	Tacoary river	145
San Pedro point	51	Tacuarembó department	37
— — town	146, 152, 153	Tala pass	153
— — tree	56	Tapajoz river	141
— — river	134	Tercero river	137
San Rita point	51, 53, 54	Tiete river	134
Santa Anna bank	57, 58	Tigre island	46
Santa Barbara battery	29	— point	46, 47
Santa Catherina	6, 150	— river	93
Santa Fé province	73, 82, 83, 85, 87, 137	Tiraja town	147
— — town	137, 140, 154	Toros cerro	17
Santa Lucia bay	46, 47	Torres islands	7, 8
— — bank	46, 48		

	Page.	V.	Page.
Triton bank.....	32	Vaccaria plains	150
Tuenman city	78, 96	Valparaiso	96
—— province	73, 80, 96	Vellhas river	134
Tuna islet.....	9, 12	Verde river	134
Tnya bank	59, 60	Vermejo river	147, 153
U.		Vermelho river	142
Ubiraba lake	143	Vertentes sierra	134
United States...38, 39, 42, 44, 73, 75, 76, 78,		Villa Franca.....	154
79, 90, 92, 97		Villa Maria	142, 153
Uruba-Pnnga fall	134	Villeta town	154
Uruguay river .. 1, 2, 43, 57, 79, 83, 87, 111,		Virissimo river	134
129, 130, 150, 151, 152, 154		Y.	
—— Republic ..15, 36, 37, 38, 39, 40, 78, 80-		Yaguaron river	37
86, 91, 150, 151		Yatay town	87
Uruguayana town	87	Yeguas point	1 45, 46

LIST OF LIGHTS.

	Page.
Buenos Ayres Custom-house light.....	68
—— — Guard-ship light.....	68
Chico light-ship.....	64
Colonia light.....	52
East Point light, (Maldonado)	14
English Bank light-ship.....	101
Flores Island light	25
Indio Point light-ship	63
Maldonado light, (East point)	14
Martin Garcia light	57
Montevideo Cathedral.....	30
—— Corro	31
—— Harbor	30
Panela light-ship.....	46
Santa Maria light	10



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